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UNITED STATES DEPARTMENT OF AGRICULTURE

In Cooperation with the Agricultural Experiment Station
State College of Washington

DEPARTMENT BULLETIN No. 1388

Washington, D. C. ▼ March, 1926

FARM MANAGEMENT PROBLEMS ON IRRIGATED FARMS IN HAY AND POTATO AREAS OF THE YAKIMA VALLEY, WASHINGTON

By

E. R. JOHNSON, Assistant Agricultural Economist, Bureau of Agricultural Economics, and
S. B. NUCKOLS, Associate Agronomist, Bureau of Plant Industry

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In planning good farm organization for Yakima Valley farms, many questions arise. On farms where alfalfa and potatoesare the principal sources of cash income, earnings have been largely determined by the area devoted to these crops each year and the price of the crops when sold. Since price fluctuations for these crops have been frequent, farm earnings have been very uncertain and difficult to estimate in advance. Many Yakima Valley farmers are puzzled to know how to apportion their crops to the best advantage, whether some livestock can be kept profitably, what kind to keep, and how much.

The study[1] summarized in this bulletin was planned for the purpose of assisting Yakima Valley farmers in their interpretation of the principles of production economics, as these affect the management of individual farms and the agriculture of the community.

The information is based upon personal interviews with farmers, merchants, and bankers in Yakima County, upon data furnished by the Bureau of Reclamation and Office of Indian Affairs of the United States Department of the Interior, upon census reports, and upon statistics of the United States Department of Agriculture.

[1] The writers wish to thank G. O. Baker, Neil Johnson, and W. R. Singleton of the Department of Farm Management, Washington State College, and H. B. Pingry and Grover Burnett for their assistance in the collecting of field data. Credit is due Miss Sudie Cox of the Division of Farm management and Costs, Bureau of Agriculture Economics, for assistance in the tabulations. Special acknowledgements are due to Vice Dean George Severance, head of the Department of Farm Management, Washington State College, for assistance in planning the survey and reviewing the manuscript, and A. E. Lovett, agricultural agent for Yakima County, for assistance in reviewing the manuscript. Thanks of the writers and departments are also extended to those farmers and others who helped to make the study possible by their hearty cooperation.

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Some of the conclusions drawn concern only the farms studied, but the general truths developed are applicable to a large number of farms in the Yakima Valley, as well as to farms in other irrigated regions in the Pacific Northwest, where conditions are somewhat similar to those in the area studied.

SUMMARY OF RESULTS

Two important facts are brought out by an analysis of the agricultural history of this area: (1) The relative importance of the various lines of farm production in a given year reflects the profits on these enterprises the previous year; (2) those enterprises that have been relatively profitable over a period of years have established themselves on most of the farms in the area.

Marketing possibilities for local farm products are among the principal factors in determining farm earnings in this area. Yakima Valley potato growers have several marketing advantages over their competitors in Northwestern States, chief among which are a low production per capita in Washington resulting in a favorable local market, a shorter rail haul to Pacific-Coast cities, and the advantage of a rail-and-boat rate to California markets.

Three typical sizes of farms—20, 40, and 80 acres—predominate in this area. The average total capital represented by the small farms in 1921 and 1922 was $7,510, medium-size farms $12,732, and large farms $21,984. The average amount of labor used per farm by the small, medium, and large farms was 14, 17.3, and 24.4 months, respectively.

Alfalfa hay and potatoes are the principal crops grown and are the principal sources of cash income. A little over half of the crop area on the farms visited is devoted to alfalfa and about one-fifth to potatoes.

Importance of livestock and corn production on many farms in this area has been tied up rather closely with the price of alfalfa hay. A series of relatively low price years for alfalfa hay has usually been followed by increased livestock and corn production.

Incomes from farming, on the average, were low in this area in 1921 and 1922. For the small, medium, and large farms the farm income amounted to $179, $600, and $809, respectively, in 1921. The low 1921 incomes were principally due to comparatively low alfalfa-hay prices, whereas poor prices for potatoes were mainly responsible for the low incomes in 1922.

Satisfactory farm incomes depend largely upon fair and stable prices, good yields, good quality of products, full utilization of the resources of the farm, a knowledge of good crop and livestock practices, and ability as a manager.

To plan effectively the organization of farm enterprises in advance, it is essential to know how the different enterprises vary in their demands upon the farmer's labor supply throughout the year. Such a knowledge results in reducing competition between enterprises to a minimum, and assists in establishing desirable complementary and supplementary relationships between different crop and livestock enterprises.

LOCATION AND DESCRIPTION OF AREA

The greater part of the Yakima Valley is located in Yakima County (fig. 1). The area is in the arid section of the State, the land in its natural condition producing nothing but sagebrush and the scantiest supply of grass, except along the streams, where subirrigation has induced the growth of more vegetation.

By means of irrigation Yakima County has become one of the leading agricultural counties in the State. The 1920 census places it eighth in number of improved acres; second in value of all farm property; third in land value per acre; first in production of orchard fruits, hay and forage, vegetables, and wool; fourth in poultry; and ninth in dairy products.

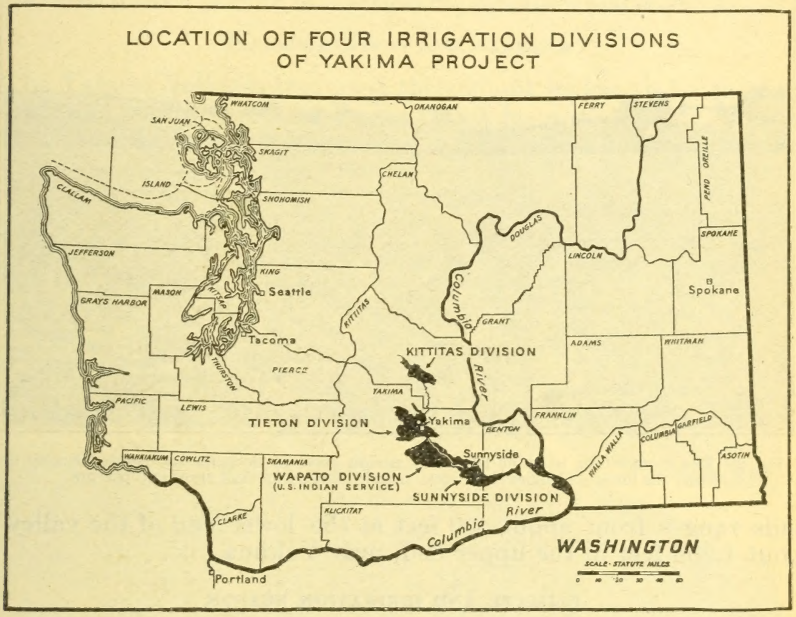

FIG. 1.—Shaded portions indicate location of areas in the Yakima Basin irrigated wholly or partly with water supplied by the U. S. Bureau of Reclamation

The type of farming in this area can be divided into two general classifications: (1) The lands which are more elevated and rolling and provide good air drainage are used largely for orchard-fruit growing; (2) the lower and more level lands are used principally for the production of hay, forage, and vegetable crops, together with more or less livestock. This report is confined chiefly to farms coming under the second classification.

Most of the farm reports used in this study were obtained on the Sunnyside division of the Yakima irrigation project. This division has a large number of well-established farms on which nearly all of the farm income is obtained from the growing of alfalfa, potatoes, corn, small grains, and livestock.

SOIL AND TOPOGRAPHY

The soil, generally speaking, is a silt loam with deep subsoil, especially on the bench lands. The lower lands close to the rivers are to a large extent composed of gravelly subsoil covered by sandy soil ranging from a few inches to a few feet deep. Alkali spots, in a few of the lower areas, have given more or less trouble, but this is being partly overcome by drainage, a better understanding of the management of alkali lands, and a better knowledge of the application of water. The topography of most of the irrigable land varies from almost level to gently rolling (fig. 2). The elevation of these

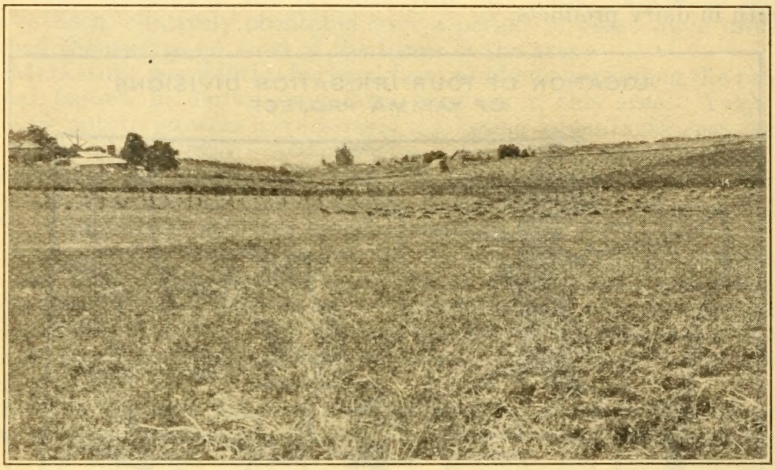

FIG. 2.—The more rolling irrigated lands that permit good air drainage are devoted largely to fruit; the lower and more level lands are used largely for field crops and pasture

lands ranges from about 400 feet at the lower end of the valley to about 1,200 feet in the upper end, near Yakima.

CLIMATE AND IRRIGATION SEASON

High temperatures are usual throughout the summer, especially during July and August (Table 1); but owing to the dryness of the atmosphere, the heat is seldom oppressive and the nights, even in midsummer, are agreeably cool. On account of the mild winters—the temperature seldom goes below zero—farm operations are usually interrupted only for a few weeks. The precipitation, which comes mostly during the nonirrigating season, averages considerably less than 10 inches, ranging from 6 inches at Kennewick to 11 at Ellensburg.

The growing season ranges from five months in the upper valley to seven months in the lower valley. The irrigation season on the Sunnyside division is from April 1 to October 31, or 214 days.

TABLE 1.—*Climatic conditions at the Sunnyside station Yakima County, Wash.*

Year and average	Temperature					Precipitation	Date of last killing frost in spring	Date of first killing frost in fall	Frost-free period
	Maximum		Minimum		Mean				
	Month	°F.	Month	°F.	°F.				
						Inches	*Date*	*Date*	*Days*
1921	August	100.0	December	0	52.0	6.92	Apr. 24	Sept. 12.	140
1922	July	107.5	December	−11.5	49.9	4.85	May 9	Oct. 28	171
1923	August	104.0	February	2	52.7	6.22	Mar. 26	Oct. 23	210
Av., 1914–1923		104.4		−2.9	51.4	6.55	Apr. 25[1]	Sept. 29[2]	178

[1] The last killing frost in the spring did not occur later than April 25 during 8 of the 10 years.
[2] The first killing frost in the fall did not occur earlier than September 29 during 8 of the 10 years.

TRANSPORTATION AND MARKETS

The Yakima Valley is traversed throughout its length by the main line of the Northern Pacific Railway and for a portion of its upper length by the Chicago, Milwaukee & St. Paul Railway. Branch

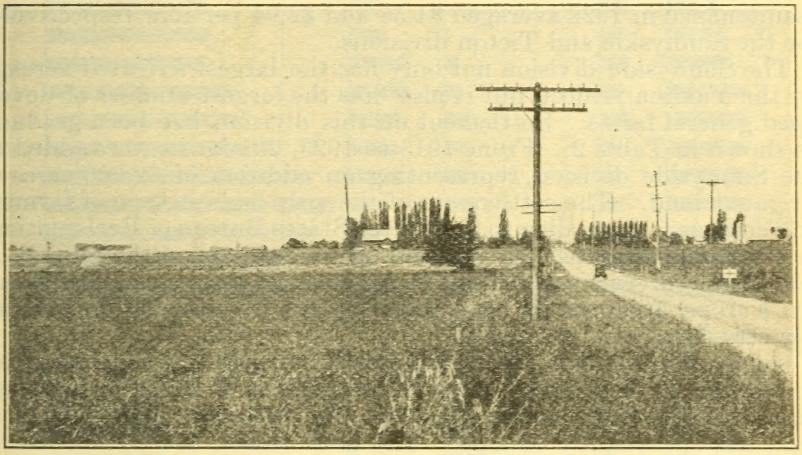

FIG. 3.—Many of the farms in the Yakima Valley are served by good roads. A large part of the Sunset Trail, which passes through the valley, is paved

lines of the Northern Pacific and the Union Pacific systems connect several of the towns in the valley. The county is well supplied with good roads. Much of the Sunset Trail, a national highway (fig. 3), which passes through the valley, is paved. Approximately 80 per cent of the farmers own automobiles.

Markets for the bulkier products are furnished by the cities of the Pacific coast, British Columbia, and Alaska. Apples, and occasionally potatoes, seek more distant markets throughout the United States. The railroad mileage from Yakima, Wash., to some of the principal markets is: Seattle, 164 miles; Spokane, 236; Portland, Oreg., 311; San Francisco, 1,083; St. Paul, 1,704; Chicago, 2,081.

AGRICULTURAL HISTORY OF AREA

DEVELOPMENT OF AGRICULTURE IN AREA

Progress in irrigation in the Yakima Valley has been steady from the beginning. The first irrigation projects, moderate in size, were started and successfully carried out by private companies; but as private capital was inadequate to meet the needs for the development of the larger projects, the United States Reclamation Service in 1905, was authorized to take over the projects, and construction was begun the following year.

The ultimate irrigation of seven divisions, comprising approximately 450,000 acres, is included in the plan of the Yakima project. Divisions completed or nearly completed are: Tieton, 32,000 acres (completed), and Sunnyside, 107,000 acres (95 per cent completed). On the Yakima Indian Reservation the Wapato division has about 85,000 of its 120,000 acres under irrigation. Most of the other divisions are as yet comparatively undeveloped. In all, about half of the 450,000 acres included in the plan of the Yakima project is now under irrigation.

The cost per acre for construction averaged $52 on the Sunnyside division and $96 on the Tieton division. Charges for operation and maintenance in 1922 averaged $1.55 and $2.94 per acre, respectively, for the Sunnyside and Tieton divisions.

The Sunnyside division not only has the largest irrigated acreage on the Yakima project, but it also has the largest number of developed general farms. Settlement on this division has been gradual, as shown in Table 2. From 1913 to 1923, 731 farms were added to the Sunnyside division, representing an addition of 32,200 acres of irrigated land. The settlers are of the very highest type of farmers and citizens. According to the United States Bureau of Reclamation, in 1923 approximately 80 per cent of the farmers on the Sunnyside and Tieton divisions were born in America, 10 per cent in northwestern Europe, 5 per cent in central and eastern Europe, and the remainder elsewhere.

On the Wapato division, development has been more or less interrupted, partly because of the small proportion of white owners and partly because of the leasing situation. In 1923 about half of the farm land was operated by tenants. The short leases, usually not over a year, do not encourage a desirable or permanent type of agriculture. Eventually, as more land on the Indian reservation become operated by owners, the larger farms will be broken up into smaller units and much the same type of agriculture will prevail on this division as on the Sunnyside division.

The development of agriculture in the area is also reflected in the changes which have taken place in the total acreage of important crops. There has been a general increase in the total acreage of alfalfa, small grains, and potatoes during the 11-year period, but several reductions in these acreages have occurred within the period, as will be seen in Figure 4. These variations often reflect rather closely profits or losses on a particular crop the previous year.

TABLE 2.—*Agricultural development on Sunnyside and Wapato irrigation divisions, 1913–1923*

Year	Sunnyside division				Wapato division, total area cropped
	Farms	Population on farms	Area bureau prepared to supply water	Area actually irrigated	
	Number	*Number*	*Acres*	*Acres*	*Acres*
1913	2,450	7,322	80,607	62,800	32,831
1914	2,447	6,900	81,306	64,100	38,385
1915	2,450	7,270	81,807	67,000	40,605
1916	2,553	7,844	89,250	71,400	48,123
1917	2,682	8,000	97,285	80,500	57,707
1918	2,740	8,255	98,537	84,650	66,481
1919	2,810	9,477	100,130	90,000	68,500
1920	2,905	10,929	100,732	93,610	72,658
1921	3,065	12,080	101,509	94,500	74,344
1922	3,138	12,332	101,339	95,000	79,520
1923	3,181	10,128	101,329	95,000	80,767

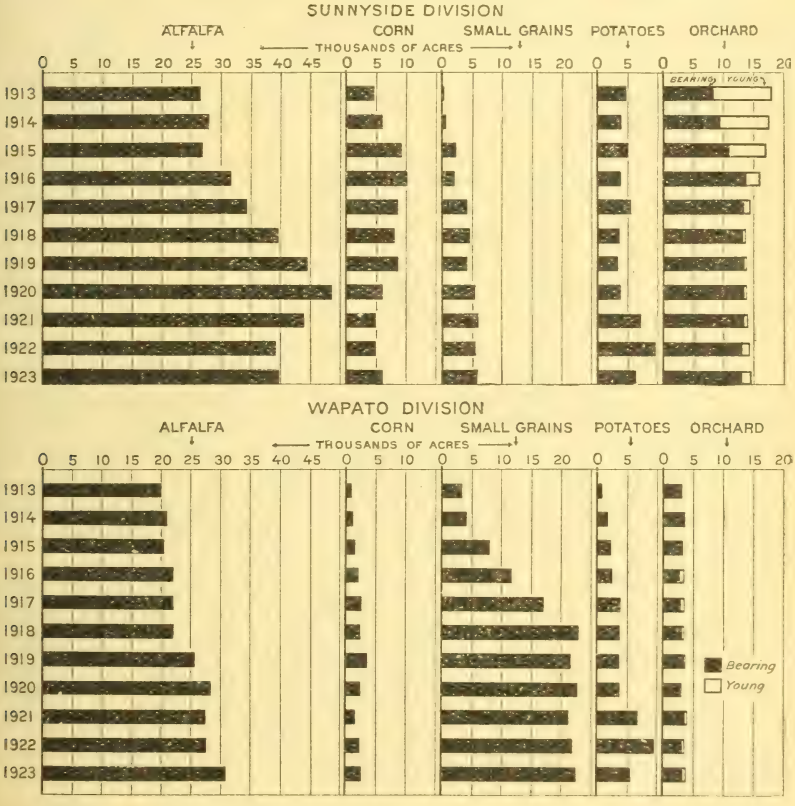

FIG. 4.—Acreage of important crops on Sunnyside and Wapato irrigation divisions, 1913–1923

Fruit growing is an important enterprise on the bench lands on the Sunnyside division where good air drainage is available. Apples are by far the most important fruit crop, representing 77 per cent of the bearing orchard area in 1923. Pears are next with 13 per cent, peaches 7 per cent, and prunes 3 per cent.

The peak in the orchard-fruit acreage came in 1916. (See fig. 4.) Since then the acreage has decreased slightly, largely because of weeding out less profitable kinds and varieties of fruit. The establishment of local canneries and fair pear prices and yields, in recent years, have resulted in an increase in the pear acreage since 1916.

Alfalfa, potatoes, and wheat have been the principal enterprises from which most of the farmers, other than fruit growers, in this area have received their incomes. The first two of these crops are so well adapted to the soil and climatic conditions in the valley that their production often becomes specialized and quickly responds to changes in the price relationship of hay, forage, and vegetable crops.

Sugar beets promised to play an important part in the farm organization when first introduced into the valley in 1917. Three beet-sugar factories were erected in anticipation of a large beet acreage. In the first year 1,976 acres of sugar beets were grown on the Sunnyside division, with an average yield of 10 tons. The following year saw the largest beet acreage in the history of the valley, when 4,074 acres were planted on the same division. But with a low yield, averaging only 5 tons per acre, sugar beets were relatively unprofitable. Since then the acreage has gradually declined, and in 1925 sugar-beet growing was abandoned until a time when the curly top disease is more under control and sugar-beet production is made more profitable to the growers.

From 1914 to 1917 cattle and hogs were comparatively important on the Sunnyside division farms. More livestock also meant more corn, as nearly all of the corn produced is fed on the farm. These facts will be noted from a study of Tables 3 and 4. The great demand for alfalfa hay from western Washington dairymen from 1916 to 1920 made the production of this crop unusually profitable. The alfalfa acreage per farm was increased, and many farmers reduced considerably their number of cattle and hogs. Reduction of the alfalfa acreage, beginning with 1921, was partly due to the drop in the price of hay. Another factor that had an important part in this reduction was the comparatively low potato production in 1919, not only in Yakima County, but throughout the United States, together with the highest potato prices in the history of the country. As potatoes usually follow alfalfa in the crop rotation, and as the price of alfalfa hay was relatively low, most of the increased potato acreage came out of alfalfa, as will be seen in Figure 4.

With the increased acreage and production of potatoes prices dropped; but even at lower prices in 1921, Yakima farmers had unusually high yields, which maintained high profits per acre, and the already overexpanded potato acreage was still further increased in 1922. The inevitable happened; potatoes were a drug on the market, and the high price of labor and materials almost ruined many farmers who specialized too heavily in this crop. Naturally the potato acreage was sharply reduced the following year. (See fig. 5.)

TABLE 3.—*Number of livestock per farm on Sunnyside division 1913–1923*

Year	Number of farms	Average number of head per farm				
		Horses and mules	Cattle	Hogs	Sheep	Poultry
1913	2,450	2.8	3.0	6.6	1.8	44
1914	2,447	2.8	3.7	9.8	.8	46
1915	2,450	2.5	4.5	13.3	2.7	47
1916	2,453	2.6	4.5	7.6	2.4	44
1917	2,682	2.6	4.1	5.5	2.9	44
1918	2,740	2.7	3.3	6.1	3.3	41
1919	2,810	2.8	3.1	5.5	3.4	48
1920	2,905	2.6	3.5	5.0	2.0	51
1921	3,065	2.4	3.0	3.5	1.8	58
1922	3,138	2.4	3.9	3.9	1.9	71
1923	3,181	2.3	4.0	6.0	1.8	67

TABLE 4.—*Number of crop acres per farm on Sunnyside division 1913–1923*

Year	Average number of acres per farm										
	Alfalfa		Corn (all)	Potatoes	Small grain	Miscellaneous	Pasture	Orchard		Duplicated area	Total acres in crop[1]
	Old	Young						Bearing	Young		
1913	9.9	1.0	1.8	1.9	0.1	1.8	0.9	3.4	4.0	1.0	24.8
1914	10.7	.7	2.4	1.6	.2	1.4	1.0	3.8	3.4	1.0	25.2
1915	10.6	.3	3.7	1.6	.9	1.3	1.4	4.5	2.5	1.6	26.8
1916	11.1	1.3	4.0	1.5	.7	1.7	1.4	5.4	.9	2.5	28.0
1917	11.8	1.0	3.1	2.0	1.5	2.3	1.5	5.0	.4	2.7	28.6
1918	13.3	1.1	2.9	1.3	1.6	3.3	1.5	4.8	.2	3.0	30.0
1919	14.7	1.1	3.0	1.2	1.4	2.1	2.2	4.8	.2	2.4	30.7
1920	15.7	1.1	2.1	1.3	1.8	2.0	2.0	4.6	.1	2.3	30.7
1921	13.5	.8	1.6	2.3	1.9	1.9	1.9	4.4	.3	1.2	28.6
1922	11.8	.6	1.6	3.0	1.7	2.1	2.1	4.1	.4	.7	27.4
1923	11.9	.6	1.9	1.9	1.8	2.0	2.2	4.1	.5	.7	26.9

[1] Does not include duplicated area.

Most of the increase in the small-grain acreage since 1913 is represented by wheat and was largely made at the expense of corn. Barley and oats have not been able to compete successfully with wheat, because the returns per acre have been comparatively low and the labor and materials required for each of the grain crops is about the same. The low yield and low prices of wheat in 1921 made this crop relatively unprofitable, resulting the next year in a break in the many successive years of increase in wheat acreage.

A study of local prices will often help to throw light on factors which play a large part in the efficient selection and organization of farm enterprises. The trend of local prices helps to show whether price changes for different commodities tend to be small or large, temporary or permanent, and also shows the tendency of changes in the price of some commodities to lag behind changes in the general price level. Such a study also helps farmers to compare price advantages of different commodities at a given time, and, when properly understood, price trends help the farmer to guess more accurately what prices are likely to be in the future.

Some price trends, important to farmers in the Yakima Valley, are shown in Table 5. All farm prices were comparatively high during the middle part of the 11-year period, 1913–1923, but considerable variation is noticed in the time and rate at which the price level

changed for the different commodities. The price level for alfalfa hay and wheat rose and dropped more abruptly than the price level for potatoes, whereas sheep prices rose and dropped sooner than the price of hogs. Butterfat prices did not reach the high-price levels of the other farm products; neither did they experience the same disastrous decline following the World War.

FIG. 5.—Crop value per acre for alfalfa and potatoes and the percentage of the total crop area devoted to each of these crops. Sunnyside division, 1913–1923

TABLE 5.—*Index numbers of prices to producers of farm products for Yakima, Wash., and Washington State, 1913–1924*[1]

Year	Crops			Livestock and livestock products				Wages of common labor at Yakima June 1913=100[3]	Freight rates (average of months) 1913=100[4]
	Alfalfa hay, Dec. 15, 1914=100[2]	Potatoes, Dec. 15, 1913=100	Wheat, Dec. 15, 1913=100	Hogs, Dec. 15, 1913=100	Sheep, Dec. 15, 1913=100	Butterfat Dec. 15, 1913=100	Eggs, Dec. 15, 1913=100		
1913	----------	100	100	100	100	100	100	100	100
1914	100	85	137	85	106	94	105	96	100
1915	107	95	111	71	117	89	102	103	100
1916	131	170	181	120	151	117	112	109	100
1917	222	148	256	207	236	133	130	126	100
1918	238	150	259	207	206	172	165	145	115
1919	254	300	303	196	177	192	188	180	127
1920	192	147	180	135	100	153	148	213	150
1921	72	153	115	101	89	131	120	172	158
1922	178	70	139	113	138	136	112	145	142
1923	110	117	115	100	134	144	110	145	142
1924	169	147	191	117	162	----------	122	----------	----------

[1] Index numbers of crops, livestock, and eggs are compiled from office records of the Division of Crop and Livestock Estimates; butterfat figures are compiled from prices paid to producers by an important buyer of cream in the Yakima Valley.
[2] Data not available prior to 1914.
[3] United States Interior Department, Bureau of Reclamation.
[4] Compiled from data furnished by the Northern Pacific Railway Co.

Changes in the price of some of the items used extensively by farmers in producing and marketing their crops, such as labor and transportation, lagged behind the changes in prices of farm products. This is the usual situation. The payment of high wages, taxes, and transportation costs with cheap products has been the principal difficulty confronting the Yakima Valley farmers. To the eastern farmer the high freight rates proved a protection from the shipping in of the more bulky and perishable products from the West.

From this historical study of agriculture on a large number of farms in the Yakima Valley, several facts are recognized which are of significance to farmers in planning the organization of their farms:

1. The relative profitableness of many crop enterprises for a single year has largely determined the relative importance of these crops on farms the following year.

2. In a period of falling agricultural prices there is more or less tendency for farmers to rush from one thing to another in the hope of hitting the right thing. This is particularly true of farmers growing annual crops and having considerable choice in the selection of enterprises each year. It takes these farmers less time to go in or out of their principal enterprises than would be required by a livestock man or fruit grower.

3. Farmers who base their acreage of different crops entirely upon the relative returns from these crops for the previous year usually defeat their own chances for favorable crop returns, because they too often help to accentuate the overproduction or underproduction of these commodities.

4. Those enterprises that have been relatively profitable over a period of years have established themselves on most of the farms in the area.

MARKETS AND MARKETING PROBLEMS

Before a production program is attempted it is important to consider the possibilities for efficient marketing. This is particularly true of such areas as the Yakima Valley, where the principal agricultural products are grown in large surplus quantities. Farmers in this area usually experience greater difficulties with marketing than with production. A study of the average crop prices received by the farmers visited (Table 6) and the number of farmers receiving different prices for their potatoes (Table 7) emphasizes the importance of satisfactory and dependable prices for the principal sources of cash income on general-crop farms in the Yakima Valley. Satisfactory prices are largely dependent upon marketing possibilities.

The importance of studying markets along with the production program is emphasized by Henry C. Taylor[2] when he says:

> If markets could be so controlled as to absorb at a satisfactory price anything which the farmer may choose to produce and in any quantity which the effort of man and the response of nature may determine, the problem of farm management would be greatly simplified. Those who feel this to be a simple task should not overlook the fact that it involves the full control of the desires of the consuming public and the power so to adjust these desires that the demand will always equal the supply at a price satisfactory to the farmer.

[2] Henry C. Taylor, then chief of the Bureau of Agricultural Economics, U. S. Department of Agriculture, in address before a conference of western extension workers, Salt Lake City, Utah, Feb. 8, 1921.

TABLE 6.—*Average prices obtained by farmers visited, 1921 and 1922.*

Crop	Unit	Price obtained	
		1921	1922
Potatoes	Ton	$20.00	$11.00
Hay in stack	do	4.28	9.15
Hay baled	do	8.85	14.67
Wheat	Bushel	1.05	1.03
Rutabagas	Ton	15.81	9.34
Sugar beets	do	6.00	7.50

TABLE 7.—*Potatoes: Specified average prices received by farmers visited, number of sales, and quantity sold*[1]

Average price received per ton	1921		1922	
	Number of sales	Total tons sold	Number of sales	Total tons sold
$30 and over	8	492		
$25 to $29	11	813		
$20 to $24	30	1,753	8	231
$15 to $19	21	1,226	13	825
$10 to $14	24	848	50	2,711
$5 to $9	4	162	35	2,165
Less than $5			7	226
Total	98	5,294	113	6,158

[1] One farmer sold no potatoes from the 1921 crop and 14 reported no sales from potatoes grown in 1922. These are not included in the table.

A knowledge of what becomes of the product after it leaves the farm, the competition from other areas, and the kind and quality of products desired by the public all help the farmer to remove "guesses" when he plans the selection and adjustment of his farm enterprises.

POTATOES

Potatoes are produced abundantly and economically in the Yakima Valley. Even in 1919, when the potato acreage was exceedingly low in this area, Yakima County was credited with having 13.4 per cent of the State potato acreage. The yield was 205 bushels per acre, compared with the State average of 106 bushels. The ideal soil and climatic conditions for potato production in this area is very encouraging to high-pressure production, especially following years of good potato prices.

Fair yields of late potatoes are produced over a large part of the United States. Because of this fact and the fact that potatoes will usually buy but a comparatively small amount of transportation, it is not surprising to find that the large surplus potato-producing areas are located as near as possible to the centers of population. This is illustrated in Figure 6, which shows the relative production of late potatoes in excess of 3 bushels per capita, by States, for the year 1923. The State prices for the same year are also given. With such a large area on which potatoes can be grown it is not difficult to understand why potato acreages and prices are very elastic and tend to fluctuate widely from year to year.

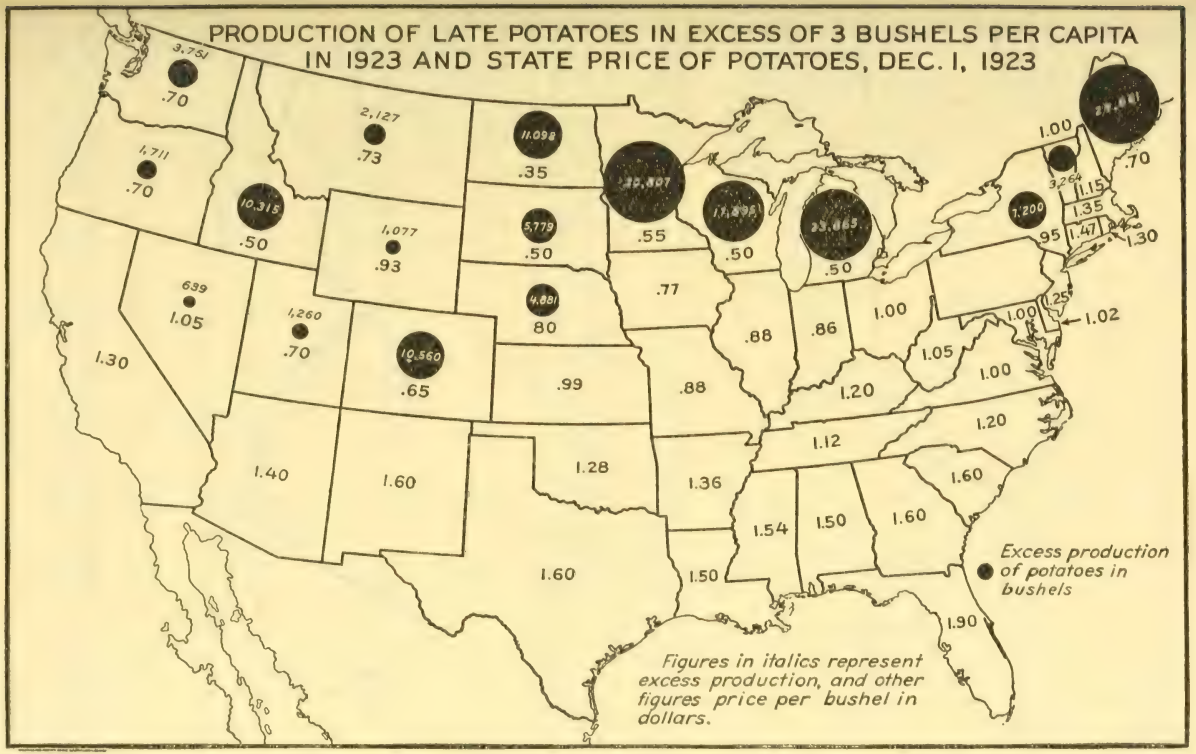

FIG. 6.—Fort Worth, an important diversion center for the Southwest, draws its potato supplies mainly from Idaho and Colorado. Chicago is also a more important potato market for Idaho than for Washington largely because of lower freight rates. From July, 1921, to June, 1922, Idaho supplied 17 per cent of the potato car unloads at Chicago, and 10 per cent the following year. The Yakima farm price of potatoes for December 1, 1923, was 57 cents per bushel, or 13 cents less than the State price

Yakima Valley potato growers have several marketing advantages over their competitors in the Northwestern States, largely because of a low production per capita in Washington resulting in a favorable market in the State, (fig. 7), a shorter rail haul to Pacific

PER CENT OF U.S. PRODUCTION PER CAPITA
300
200
100
Northwest
Washington
U.S. Production per Capita
YEAR -- 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923
U.S. PRODUCTION PER CAPITA 3.4 4.2 3.6 2.8 4.3 3.9 3.1 3.8 3.3 4.1 3.7

FIG. 7.—Potato production per capita in Washington and in the Northwest as a percentage of the per capita production in the United States. The States included in the Northwest are Idaho, Colorado, Washington, Montana, and Oregon

Northwest cities, and the advantage of a rail-and-boat rate to California markets. During two years only, 1916 and 1919, was the average farm price in the five Northwestern States higher than the Washington farm price (fig. 8). During these two years the potato

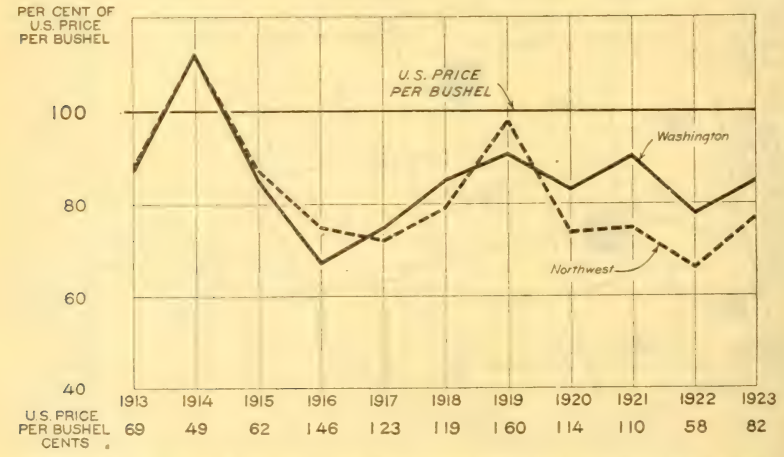

FIG. 8.—Potato prices in Washington and in the Pacific Northwest as a percentage of the United States price

production per capita throughout the United States was exceptionally low, amounting to only 2.8 bushels in 1916 and 3.1 in 1919. This tended to raise the price in the East sufficiently to create a strong demand for western potatoes. Accordingly the States of

Idaho, Colorado, and Montana, having less freight to pay, were able to realize a higher farm price for potatoes.

The California market has become increasingly important in recent years as an outlet for a part of the surplus potato production in western States, largely because the potato production in California has not kept pace with the demand. A 20-cent lower freight haul to San Francisco because of a combined boat and rail haul, gives the Yakima Valley potato grower a distinct marketing advantage over his principal competitors from southern Idaho.

But in spite of advantages in supplying potatoes to Pacific Northwest and California markets, Yakima Valley potato growers have often suffered severe losses along with their competitors in adjacent potato areas. This has been especially true in years of overproduction of potatoes throughout the United States, which has automatically cut off the eastern markets, because of the low value of potatoes and long freight hauls. A study of freight rates from Yakima, Wash., and other States having a large surplus production, to important markets (Table 8) shows the importance of the freight handicap which western potato growers must face in supplying eastern potato markets.

TABLE 8.—*Freight rates on potatoes from Yakima, Wash. and competitive States to important markets* [1] *(cents per 100 pound)*

From—	To—				
	San Francisco	Los Angeles	Fort Worth	Chicago	New York
	Cents	*Cents*	*Cents*	*Cents*	*Cents*
Yakima, Wash.	55½ [2] 36½	76	110	110	151
Idaho Falls, Idaho	56½	56½	94	77	120
Kalispell, Mont	85	106	110	90½	151
Ogden, Utah	62	63½	87	77	120
Monte Vista, Colo		106	82	65	120
Minneapolis, Minn			106	26	70
Waupaca, Wis		113	98	20½	67

[1] These are straight freight rates and do not include heater or refrigeration charges.
[2] Combination boat and rail rate.

Compiled from report on "Idaho Late Potato Deal, season 1923–24." Division of Fruits and Vegetables.

Some of the marketing disadvantages incident to great distances to important markets can be partly overcome by featuring the high quality of local products and improving the machinery for efficient marketing.

Potato growers on western irrigated farms have a distinct advantage in quality over their eastern competitors. A few well-graded and branded bags of western potatoes now appear on eastern markets and usually obtain a considerable premium over less carefully graded stock in plain bags. On December 8, 1923, the Chicago market quoted Idaho Russets U. S. No. 1 at $1.85 to $2.25 per 100 pounds; Wisconsin Whites U. S. No. 1. $1 to $1.10, and Minnesota Whites $0.90 to $1. This suggests the possibility of extending the markets for a part of the local potato crop. By careful grading and preserving the identity of potatoes which are to be shipped long distances and compete with potatoes from areas near the large markets,

it will be easier to create and maintain a demand which is willing to pay a higher price for high-quality potatoes. The better price will therefore have the effect of bringing the eastern markets nearer to the regions of supply, because it cost just as much to ship a carload of poor potatoes as one of good potatoes. Shipping out only the best grades of potatoes would reduce the local surplus and thereby tend to raise the average price for the total production.

An economical disposal of the entire potato crop in the Yakima Valley requires efficient machinery for orderly marketing. This usually involves cooperative effort on the part of a large number of growers. Potato growers should study the results attained by successful cooperative marketing associations on the Pacific coast and determine to what extent it is possible for them to share in the same advantages which have come to these groups of farmers through efficient organization and marketing.

Farmers who make a practice of growing potatoes every year need to understand the character of the potato industry. They should know why production responds quickly to changes in price, yield, and acreage throughout the United States and how to adjust their own production to this basis. A potato grower often needs to be more of a marketing specialist than a production specialist.

ALFALFA

Over 41 per cent of the State alfalfa acreage in 1919 was credited to Yakima County. Although the area produces the highest quality of alfalfa hay, this product or its substitutes is also produced generally throughout the United States. For this reason and the fact that alfalfa hay will buy even less transportation than potatoes, the marketing possibilities for this crop are even more local than for potatoes. The demand for surplus Yakima Valley hay comes principally from the intensive dairy sections throughout the State and from the State sheep industry. When the hay crop in other sections of the State has been reduced by drought or spoiled by a rainy harvest, the Yakima Valley alfalfa growers receive high prices for their hay. In years of generally good hay crops, a large part of the Yakima hay must be sold at a low price, often below the cost of production. This has happened twice since the World War, first in 1921 and again in 1923.

The economical production of alfalfa hay in the Yakima Valley together with the fact that it is sometimes difficult to obtain a satisfactory price for the crop, seems to indicate that more of the alfalfa should be fed locally to livestock. This would tend to increase the price of hay to be sold by decreasing the surplus and also turn a large part of the cheap hay and fodder into livestock or livestock products which can better stand the high transportation costs to distant markets.

A BUSINESS ANALYSIS OF PRESENT FARMING IN YAKIMA COUNTY

Good farm organization in an area is better understood by an analysis of how farmers are at present utilizing the resources at their command and of the variations in the success which they attain. Such an analysis[3] was made of 111 representative farms in this area

[3] Only a small number of the representative developed farms visited were operated by tenants. For this reason, the study does not include a discussion of tenant farming in the Yakima Valley.

for the crop year 1921 and of 139 farms for the following year. These individual farm reports were obtained through trained enumerators who personally interviewed each farmer. The reports are for the farm year March 1 to February 28 and form the basis for this study.

Three typical-size farm units predominate in this area. These are farms of 20, 40, and 80 acres each, with a few variations from these units. In order to permit a better understanding of problems and conditions on different-sized farms, each farm was placed in the group nearest the 20, 40, or 80-acre unit to which it belonged. For convenience these farms are designated as small, medium, and large. No farms smaller than 20 acres were studied.

RESOURCES USED IN FARMING

The land, capital, and labor resources used in operating the different-sized farms are shown in Table 9. The small farms have an average of 23.6 acres, medium farms 40.6 acres, and the large farms 79.7 acres for the two years. The average real-estate value per acre for each group ranged from $232 to $266 in 1922. For the same year the working capital, which consists of livestock, equipment, feed and supplies, and cash to run the farm, averaged $44, $43, and $32 per acre, respectively, for the small, medium, and large farms.

TABLE 9.—*Distribution of farm resources of land, capital, and labor per farm, on farms of different size*

Item	Unit	Size of farm					
		Small		Medium		Large	
		1921	1922	1921	1922	1921	1922
Farms	Number	26	33	60	67	25	39
Acreage per farm, total	Acre	23.5	23.7	40.8	40.4	83.5	75.8
Acres in crop	do	20.3	19.8	35.8	34.7	70.7	63.3
Acres in pasture	do	1.6	1.6	2.8	2.8	7.9	4.8
Acres in farmstead and waste	do	1.6	1.9	2.2	2.6	4.9	5.3
Acres rented out	do		.4		.3		2.4
Farm capital, total	Dollar	7,931	7,090	12,962	12,502	23,914	20,055
Real estate capital	do	6,619	6,041	11,132	10,762	20,504	17,614
Working capital, total	do	1,312	1,049	1,830	1,740	3,410	2,441
Dairy stock	do	286	254	365	399	919	496
Hogs	do	19	26	44	52	42	54
Work stock	do	244	203	318	312	528	415
Other stock	do	139	72	114	123	209	185
Machinery	do	372	342	592	578	944	887
Feed and supplies	do	74	51	90	81	144	116
Cash to run farm	do	178	101	307	195	624	288
Labor used per farm, total (1922 only)	Month	14.0		17.3		24.4	
Operator[1]	do	11.4		11.6		11.8	
Other family	do	1.5		3.5		6.0	
Regular hired	do	.0		.8		2.9	
Extra hired	do	1.1		1.4		3.7	
Exchange	do	.7		1.0		1.3	
Labor used per acre,[2] total (1922)	Day	14.8		10.7		8.1	
Operator and family	do	13.6		9.3		5.9	
All hired	do	1.2		1.4		2.2	

[1] The item "Exchange" is not included in the total because the operator's labor, as listed, includes the time used by the operator in paying for Exchange labor.

[2] Total number of days of labor used on the farm, divided by the total number of acres in the farm. Twenty-five days are considered one month.

Operators of the small and medium-size farms used very little hired labor except in harvesting. Twenty months of family and regular hired labor was used on the large farms. This is equivalent to the operator's full time for a year in addition to the use of a hired man for eight months. It is seen from the table that an average of about three months of regular hired labor in addition to a considerable amount of extra day labor was used during the year by the operators of the large farms.

One of the important resources on an irrigated farm is the available supply of irrigation water. To obtain the most economical use of this resource, it is necessary for a farmer to know the water requirements of the different crops and soils on his farm and when and how to apply the water most effectively. Applying too much water on a crop is, in most cases, just as much of waste of resources as throwing away feed or labor which could be used to advantage.

Ability to manage and operate a farm is another important farm resource and varies considerably in every agricultural community. Farmers who apply the same industry and intelligence to their farm problems as do successful men to their problems in other activities are generally the ones who progress most rapidly. Because of the many variations in farmers' experiences and their theories of production economics, it is not probable that all farmers would attain the same degree of success with a certain organization, even though all other resources were equal. In this area there are a few farmers who have been generally successful with sugar beets under conditions which have caused most farmers to stop growing the crop. Some farmers are very successful with cows and hogs, whereas, others would stop farming if they were required to milk a few cows. Others are particularly successful with crops requiring considerable care and attention, such as vegetables and small fruits. The farmer's ability to manage and operate a farm is a resource upon which largely depends the successful utilization of all the other resources at his command.

CROPS GROWN AND DISTRIBUTION OF CROP AREA

The two most important crops grown are alfalfa and potatoes. (See Table 10.) Alfalfa occupies, on the average, a little over half of the total crop area; about one-fifth of the area is devoted to potatoes. Normally, the potato acreage is considerably less than that indicated in 1921 and 1922.

The importance of the various crops in the organization of the farms studied is indicated in Table 11. The number of farmers growing each crop, the average number of acres devoted to each crop by the farmers growing it, the average total yield produced, and the quantity sold and value received are given for the various-sized farms. Nearly all of the farmers produced the two important cash crops, alfalfa and potatoes.

Considerably over half of the alfalfa hay produced on the medium and large farms was sold. Even on the small farms nearly half of the hay was sold, indicating the possibility of considerable livestock expansion on farms of less than 30 acres.

TABLE 10.—*Percentage of total crop area in each crop, 1921 and 1922*

Crop	Percentage of total crop area					
	Small farms		Medium-sized farms		Large farms	
	1921	1922	1921	1922	1921	1922
Alfalfa	58	59	58	58	61	54
Potatoes	20	22	20	19	13	21
Wheat	6	5	8	9	13	11
Corn (all)	5	6	4	5	3	5
Other grain	4	2	2	2	4	2
Rutabagas	1	3	2	3	1	2
Sugar beets	4		2	1	1	1
Other crops	2	3	4	3	4	4
Total	100	100	100	100	100	100
	Farms	*Farms*	*Farms*	*Farms*	*Farms*	*Farms*
Number	26	33	60	67	25	39

Hazards involved in the overexpansion of potatoes are indicated by the percentage of the total production sold in 1921 and 1922. On the average, only half of the 1922 potato crop on the medium-sized farms was sold; 58 per cent and 60 per cent of the crop was sold on the large and small farms, respectively.

Rutabaga production was encouraged in 1921 by favorable contracts, fair prices, and good yields, but the unsatisfactory prices offered for the 1922 crop lowered the enthusiasm of many farmers who have encouraged the production of this new crop in the valley.

Corn for grain was grown by about half of the farmers on the medium and large farms and by a somewhat smaller proportion of the operators of small farms. Since most of the corn produced is fed on the farm, a high corn acreage is indicative of considerable livestock on farms.

Good yields of corn are obtainable on most farms; but considerable variation, due largely to wireworms, exists in yields, especially on many of the older farms.

Sugar beets are not generally important on the farms visited, as shown by the number of farms growing the crop and the yields obtained, as indicated in table 11.

LIVESTOCK ON FARMS

Livestock was comparatively unimportant on many of the farms visited, as shown in Table 12. It is surprising to find that more attention was not given to livestock on the smaller farms, since the proportion of crop area devoted to the principal crops was about the same for the three size groups. The operators of the small farms also sold nearly half of their hay production on the average. One explanation for this small amount of livestock on farms of 20 to 30 acres might be that, since several of the operators were considerably above the average in age, and looked upon their farms as homes rather than as businesses, they were not so seriously concerned with the most economical utilization of labor and other resources as would be the case with younger men.

Dairying is of commercial importance on comparatively few farms, although all but four of the farms visited in the two years had one or more cows. The number of dairy cows on the various size farms, in 1922, was as follows: Five of the 33 small farms, 26 of the 67 medium farms, and 14 of the 39 large farms had four cows or more.

It seems that an expansion in the hog enterprise would add to the income of many of the farms studied, particularly on farms where there is a surplus or waste of potatoes, skim milk, grain, etc.

In 1922, 2 of the 33 small farms, 13 of the 67 medium farms, and 10 of the 39 large farms had two sows or more.

TABLE 11.—*Acreage, production, and sales per farm of specified crops grown, 1921 and 1922*

Crop	26 small farms reporting in 1921					33 small farms reporting in 1922				
	Farms reporting	Acreage per farm	Production per farm	Sales per farm		Farms reporting	Acreage per farm	Production per farm	Sales per farm	
				Quantity	Value				Quantity	Value
	Number	*Acres*	*Bushels*	*Bushels*	*Dollars*	*Number*	*Acres*	*Bushels*	*Bushels*	*Dollars*
Wheat	7	4.5	195	168	166	10	3.5	119	71	73
Other grain	5	3.5	140	62	41	3	3.3	209	105	68
Corn for grain	9	2.5	99	3	6	16	2.2	110	9	6
			Tons	*Tons*				*Tons*	*Tons*	
Alfalfa	26	11.0	49.0	19.7	145	33	11.3	52.5	25.4	317
Potatoes	21	4.6	38.8	29.8	503	28	5.0	50.7	30.4	341
Corn for silage	2	1.2	9.0							
Sugar beets	3	6.3	28.7	28.7	172					
Rutabagas	3	1.5	20.0	20.0	324	6	2.7	31.0	10.9	60
New alfalfa	6	2.4	1.5			15	2.9	1.8		
Other crops	6	1.8			52	9	1.9			65

Crop	60 medium-sized farms reporting in 1921					67 medium-sized farms reporting in 1922				
	Number	*Acres*	*Bushels*	*Bushels*	*Dollars*	*Number*	*Acres*	*Bushels*	*Bushels*	*Dollars*
Wheat	22	7.7	335	270	308	30	6.8	255	208	236
Other grain	7	5.2	189	101	69	7	5.5	270	187	104
Corn for grain	30	2.7	107	11	6	35	2.9	174	22	20
			Tons	*Tons*				*Tons*	*Tons*	
Alfalfa	60	19.8	90.2	55.6	425	66	19.7	95.9	60.4	832
Potatoes	55	7.5	67.2	53.3	1,148	61	6.9	68.6	34.5	382
Corn for silage	3	1.7	23.3			3	2.8	40.8		
Sugar beets	3	14.8	52.7	52.7	313	2	3.0	18.5	18.5	138
Rutabagas	10	3.8	51.0	39.7	686	12	6.2	78.3	54.5	548
New alfalfa	16	3.9	6.0			18	5.3	3.6		
Other crops	16	5.2			40	19	5.8			67

Crop	25 large farms reporting in 1921					39 large farms reporting in 1922				
	Number	*Acres*	*Bushels*	*Bushels*	*Dollars*	*Number*	*Acres*	*Bushels*	*Bushels*	*Dollars*
Wheat	13	17.5	749	690	684	17	15.5	632	579	559
Other grain	6	11.6	420	231	124	5	9.4	344	271	184
Corn for grain	10	2.8	144	72	43	19	4.8	281	10	9
			Tons	*Tons*				*Tons*	*Tons*	
Alfalfa	25	41.7	195.8	158.1	1,341	39	33.4	148.9	107.5	1,553
Potatoes	23	9.8	87.7	75.4	1,463	38	13.6	144.7	84.5	896
Corn for silage	5	6.5	27.5			4	5.0	56.2		
Sugar beets	2	4.8	23.5	23.5	141	1	37.0	424.0	424.0	3,180
Rutabagas	4	6.1	87.0	82.0	1,144	6	7.2	92.0	48.3	415
New alfalfa	6	6.7	8.2			8	12.9	41.0		
Other crops	11	5.5			132	14	6.7			227

TABLE 12.—*Average number of livestock and sales of livestock and livestock products per farm for farms reporting livestock in 1921 and 1922*

Livestock and livestock products	26 small farms reporting in 1921				33 small farms reporting in 1922			
	Farms reporting	Head per farm	Sales per farm		Farms reporting	Head per farm	Sales per farm	
			Quantity	Value			Quantity	Value
Livestock:	*Number*	*Number*	*Number*	*Dollars*	*Number*	*Number*	*Number*	*Dollars*
Work horses	25	2.7	0.1	10	32	2.6	-------	-------
Other horses	10	1.0	-------	-------	7	1.1	-------	-------
Dairy cows	25	2.9	.4	47	32	2.7	0.4	23
Young dairy cattle	18	1.0	.2	28	25	1.3	.3	14
Other cattle	18	1.2	1.7	27	21	1.8	1.8	38
Sheep	5	11.5	16.8	53	4	3.4	-------	-------
Hogs—								
Sows	11	1.1	.4	7	13	1.1	.2	9
Boars	2	.5	1.0	18	2	.5	-------	-------
Other hogs	6	2.0	14.8	179	11	2.3	10.9	131
Chickens	26	46.0	10.0	8	33	47.0	27.0	15
Turkeys	1	5.0	25.0	125	5	5.3	17.6	50
Livestock products sold:								
Butterfat	21	-------	[1]546	191	27	-------	[1]474	180
Eggs	21	-------	[2]232	57	28	-------	[2]279	64
Other livestock products	3	-------	-------	34	2	-------	-------	50

Livestock and livestock products	60 medium-sized farms reporting in 1921				67 medium-sized farms reporting in 1922			
	Farms reporting	Head per farm	Sales per farm		Farms reporting	Head per farm	Sales per farm	
			Quantity	Value			Quantity	Value
Livestock:	*Number*	*Number*	*Number*	*Dollars*	*Number*	*Number*	*Number*	*Dollars*
Work horses	59	3.3	0.1	17	67	3.4	0.2	18
Other horses	12	1.9	-------	-------	15	1.6	.1	17
Dairy cows	59	3.2	.6	57	66	3.7	.5	37
Young dairy cattle	36	2.1	.4	17	50	2.3	.7	34
Other cattle	41	1.5	2.0	26	45	2.1	2.4	32
Sheep	6	13.6	4.7	24	9	9.3	4.0	26
Hogs—								
Sows	23	1.7	.4	10	42	1.7	.6	20
Boars	4	1.0	-------	-------	5	1.0	.2	8
Other hogs	24	4.6	13.5	213	27	3.3	18.5	239
Chickens	59	57.0	16.0	10	67	55.0	15.0	10
Turkeys	3	7.3	43.0	184	11	6.1	36.9	139
Livestock products sold:								
Butterfat	46	-------	[1]655	230	53	-------	[1]708	269
Eggs	43	-------	[2]316	80	48	-------	[2]358	81
Other livestock products	7	-------	-------	27	8	-------	-------	28

Livestock and livestock products	25 large-sized farms reporting in 1921				39 large-sized farms reporting in 1922			
	Farms reporting	Head per farm	Sales per farm		Farms reporting	Head per farm	Sales per farm	
			Quantity	Value			Quantity	Value
Livestock:	*Number*	*Number*	*Number*	*Dollars*	*Number*	*Number*	*Number*	*Dollars*
Work horses	25	4.4	0.1	14	39	4.4	0.3	27
Other horses	6	1.5	.7	8	11	1.5	.1	2
Dairy cows	25	4.2	.9	133	39	4.0	.7	49
Young dairy cattle	18	2.7	.7	72	29	2.1	.2	18
Other cattle	20	2.6	1.8	102	30	2.3	2.2	41
Sheep	7	7.4	9.3	49	11	5.5	8.5	55
Hogs—								
Sows	14	2.0	.9	26	20	2.0	2.0	35
Boars	5	.9	.2	4	7	.6	.4	10
Other hogs	8	1.7	18.9	153	17	4.3	13.7	184
Chickens	25	44.0	6.0	4	39	64.0	26.0	16
Turkeys	-------	-------	-------	-------	6	3.2	27.7	110
Livestock products sold:								
Butterfat	17	-------	[1]760	263	30	-------	[1]765	291
Eggs	16	-------	[2]197	50	30	-------	[2]326	78
Other livestock products	6	-------	-------	74	5	-------	-------	41

[1] Pounds. [2] Dozen.

Some poultry was kept on all but one farm during the two years. The small number of farms having 100 hens or over suggests the possibility of increasing the farm earnings by increasing the size of the farm flock on several of these farms. In 1922, 3 of the 33 small farms, 10 of the 67 medium farms, and 7 of the 39 large farms had 100 hens or more.

Considerable variation exists in the number of work stock kept on the various size farms in this area. One of the problems many of the farmers can study to their advantage is the most economical amount of equipment necessary to carry on their particular type of farming. Capital invested in needless work stock or farm machinery reduces the earning power of the farm capital. From Table 13 it seems that, in most cases, 2 horses are the proper equipment for small farms, 3 horses for medium-sized farms, and 4 horses for the larger farms.

CHANGES IN ORGANIZATION OF THE SAME FARMS FROM 1921 TO 1922

In this study of crops grown and livestock kept on farms in the area in 1921 and 1922 it is observed that even in such a short period several changes have taken place in the number of farmers engaged in each enterprise as well as in the distribution of crops grown and livestock kept on the farms. As previously pointed out, these variations are largely the result of changes in the price and yield relationships of farm products from year to year, coupled with the fact that most of these farmers have a wide choice in the selection of their enterprises. The influence of relative prices and yields on the tendency of farmers to shift their enterprises from year to year is more clearly illustrated by a comparison of the organization of 60 farms operated by the same owners for two successive years.

TABLE 13.—*Variation in number of work horses per farm on farms of different size in 1922*

Number of horses per farm	Average size of farm		
	Small (23.7 acres)[1]	Medium (40.5 acres)	Large (75.8 acres)
1	----------	1	----------
2	20	19	4
3	8	22	6
4	4	17	17
5	----------	4	3
6	----------	3	5
Over 6	----------	1	4

[1] One small farm had no work stock.

These 60 farmers, in common with other farmers of the area, experienced their lowest alfalfa-hay prices in 1921. With normal yields, this resulted in a relatively low alfalfa-hay value per acre. This was also more or less true of the small grains and sugar beets. The following year the acreage of all these crops was reduced in favor of the more profitable enterprises the previous year. Although potatoes

suffered a rapid decline in price in 1921, high yields maintained relatively high profits and the already greatly overexpended potato acreage was continued another year. Relatively high prices and yields of rutabagas encouraged more farmers to plant this crop in 1922.

The shift to livestock production on many of these farms in 1922 is evident. During this year 49 dairy cows were added to some of the 60 farms, resulting in a total increase of butterfat sales amounting to 10,956 pounds. Eight more farmers kept young dairy cattle, and the farmers keeping sows were increased by the same number. Hens and turkeys also showed increases.

Much of this impetus given to livestock on the 60 farms in 1922 was due to poor hay prices the previous year and the growing interest in livestock. Whether history will repeat itself and many farmers will again decide to abandon their livestock enterprises as soon as hay prices recover is difficult to foresee. It is believed, however, in view of the recent activity and general interest in livestock in the area, together with decreasing alfalfa hay yields on many farms, that livestock will become established on a more permanent basis. Many of the farmers are beginning to feel that long-time profits from agriculture in this area can best be obtained by a careful combination of crop and livestock enterprises.

FINANCIAL SUMMARY OF FARMS

CASH RECEIPTS

Over half of the cash receipts on the farms visited came from alfalfa and potatoes, amounting to 54, 57, and 68 per cent of the total cash receipts on the small, medium, and large farms in 1922. The cash incomes from potatoes and alfalfa were reversed in 1922. (See Table 14.) This was due partly to the low potato prices resulting from overproduction and partly to the comparatively good price for alfalfa hay.

Cash receipts for dairy products were fairly uniform for the two years. By knowing the production of dairy products in advance, it is possible to calculate the returns from the dairy enterprise more accurately than for other enterprises in this area, because price fluctuations seem to be less violent.[4]

Total receipts, on the average, were less on farms the second year, mainly because of the low potato prices and the larger acreage devoted to potatoes. This decrease amounted to $123 for the small farms and $247 and $485, respectively, for the medium and large farms.

CASH OUTLAY

Taxes and hired labor were the two largest items of expense on the farms studied. When the purchasing power of farm products is low, special efforts must be made to adjust farm enterprises so that a minimum of expenses will be incurred for labor and other high-priced commodities. Enterprises requiring a considerable amount of hired labor must be studied with the view of probable

[4] See Table 19 for price trends.

returns for the extra labor needed. Many farmers in this area were able to reduce labor costs considerably by exchanging work with their neighbors. On the small farms this exchange amounted to an average of 0.7 month, while it amounted to 1.0 and 1.3 months respectively on the medium and large farms. Whenever possible, this method of obtaining the extra labor needed is very satisfactory and should be encouraged, particularly when prices of farm products are low and labor high.

The total expenses, as well as receipts, decreased in 1922, largely because of decreases in purchases of livestock and seed. Potatoes are an important item of seed expense on farms in this area, as about a half ton is used per acre. Most of the seed is brought in from other regions and range in price from $50 to $75 per ton in 1921 and from $25 to $40 per ton in 1922. A few farmers used local seed in 1922 which partly reduced this cost.

INCOMES FROM FARMING IN 1921 AND 1922

Incomes from farming were unusually low during the period of this survey and reflect the agricultural depression experienced in this area in common with many other sections of the country. Low prices for the particular crops specialized in by most of the farmers, together with high prices for labor and materials needed, are largely responsible for this condition.

Subtracting the total cash expenses from the total cash receipts left very little cash for the farmer to pay for permanent improvements and meet debts due, as indicated at the bottom of Table 14. In 1922 cash needed for permanent improvments, including irrigation construction, drainage charges, and building improvements, amounted to an average of $112 on the small farms, $220 on the medium, and $378 on the large farms.

Adding the net inventory changes to the difference between cash receipts and cash expenses gives the average income received by the operator for the use of his capital and his own and family labor for the year. This amounted to an average of $203, $573, and $776 for the small, medium, and large farms for the year 1922. In 1921, the family income amounted to $59 more on the small farms and $192 and $297 more on the medium and large size farms.

The farm income, which is the difference between all farm receipts and expenses, figuring unpaid family labor as an expense, varied considerably on the different farms as shown in Table 15. Expenses exceeded receipts on 18 of the 59 small farms for the two years, on 39 of the 127 medium-sized farms, and on 17 of the 64 large-sized farms. None of the small farms visited made a farm income of $1,500 or over during either year.

To those farmers who have mortgages on their farms, and that includes most of the farmers visited (Table 16), it is important that the capital used in the business return a fair rate of interest. During these two years of generally unhappy conditions on farms, no interest was made, on the average, by farmers in each of the three groups if the farmers allowed themselves and family wages at going rates.

TABLE 14.—*Average receipts, expenses, and income per farm on farms of different sizes studied, 1921 and 1922*

Item	1921			1922		
	16 small farms	60 medium-sized farms	25 large farms	33 small farms	67 medium-sized farms	39 large farms
Average size of farm	*Acres* 23.5	*Acres* 40.8	*Acres* 83.5	*Acres* 23.7	*Acres* 40.4	*Acres* 75.8
Cash receipts per farm:	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alfalfa	145	425	1,341	317	820	1,553
Potatoes	406	1,052	1,346	290	347	873
Wheat	45	113	356	22	106	244
Other crops	203	203	348	79	168	270
Livestock	162	209	364	128	250	270
Livestock products	204	236	229	204	275	289
Miscellaneous receipts	74	62	52	76	87	52
Total	1,239	2,300	4,036	1,116	2,053	3,551
Cash outlay per farm:[1]						
Hired labor	141	277	777	131	261	749
Livestock bought	112	147	459	43	119	74
Feed bought	51	89	70	58	83	49
Seed bought	107	167	203	80	108	270
Sacks	49	83	122	51	61	172
Baling	34	94	304	49	124	207
Threshing	8	13	50	4	12	33
Taxes, real and personal	173	313	506	178	315	510
Operation, and maintenance charges, irrigation	34	65	161	33	162	105
Auto for farm use	90	103	200	119	139	173
Repairs, machinery, and buildings	45	46	88	29	48	90
Miscellaneous expenses	87	109	199	62	81	133
Total	931	1,506	3,139	837	1,413	2,565
Income per farm:						
Cash receipts less cash outlay	308	794	897	279	640	986
Net inventory change[2]	−46	−29	176	−76	−67	−210
Family income	262	765	1,073	203	573	776
Less value of family labor	83	165	264	46	136	255
Farm income	179	600	809	157	437	521
Less 6 per cent interest on farm capital	476	778	1,435	425	750	1,203
Labor income	−297	−178	−626	−268	−313	−682
Value of farmer's labor	637	755	841	560	646	717
Return on farm capitalization,[3] per cent	−5.8	−1.2	−0.1	−5.7	−1.7	−1.0
Value of family living from farm[4]	335	440	389	317	445	482
Family income plus family living from farm	597	1,205	1,462	520	1,018	1,258

[1] Does not include cash outlay for permanent improvements such as machinery and buildings.
[2] Difference in inventory values of feed and supplies, livestock, buildings, and machinery. Minus sign (−) indicates decrease, equivalent to expense.
[3] Earnings of farm capital after all expenses and value of operator's labor have been deducted. It is the farm income, minus the value of the farmer's labor divided by the farm capital.
[4] Value of food and fuel produced and used on the farm and maintenance cost of the dwelling.

One of the important forms of income on farms is the value of the items which the farm furnishes toward the family living. For the different-sized farms this averaged from $317 to $482 (Table 14). Farmers who provide a large part of their family living from commodities produced at home not only effect cash savings which often amount to $300 to $400, but they usually have the variety of food which is essential to their health and contentment. From a study of Table 17, it would seem that many of the farmers have an opportunity to increase the importance of their farm-furnished products.

TABLE 15.—*Variations in farm incomes on farms of different sizes, 1921 and 1922*

Farm income	Number of farms					
	Small		Medium		Large	
	1921	1922	1921	1922	1921	1922
Number of farms having receipts greater than expenses:						
$2,500 and over			4	1	2	3
$2,000 to $2,499			1	1	3	1
$1,500 to $1,999			4	3		1
$1,000 to $1,499	1	1	9	7	5	6
$500 to $999	5	4	10	20	6	5
0 to $499	12	18	15	13	4	11
Number of farms having receipts less than expenses:						
$1 to $499	6	9	12	15	1	9
$500 to $999	2	1	5	7	3	
$1,000 and over					1	3
Total number of farms	26	33	60	67	25	39

TABLE 16.—*Average real estate mortgages on farms having real estate mortgages 1921 and 1922*

Item	Unit	1921			1922		
		26 small farms	60 medium-sized farms	25 large farms	33 small farms	67 medium-sized farms	39 large farms
Farmers having real estate mortgages.	Number	13	28	13	21	41	30
Average amount of real estate mortgage on mortgaged farms.	Dollars	2,415	4,889	7,077	2,680	3,988	5,124
Ratio of mortgage debt to total value of real estate on mortgaged farms.	Per cent	36	43	37	45	37	28

TABLE 17.—*Families using different amounts of commodities produced at home, 1921*

Value of product	Farms using following products		
	Butter, milk, and eggs	Meat	Garden produce[1]
	Number	*Number*	*Number*
$50 and less	6	58	67
$51 to $100	44	39	36
$101 to $150	37	12	5
$151 to $200	17	2	3
$201 and over	7	0	0

[1] Includes potatoes and fruit.

SATISFACTORY FARM INCOMES DEPEND UPON SEVERAL FACTORS

Even in such a year as 1922, when farm returns were generally discouraging, some farmers in this area made good incomes from farm-

ing. This is shown by a comparative analysis of the business of the ten 40-acre farms having the highest farm income with the ten having the lowest farm income. The average farm income for the farms with the best returns amounted to $1,321, whereas for the farms with the poorest returns, it was a minus (−) $237. In other words, the total farm receipts on the poorer farms was $237 less than the total farm expenses. The comparatively high incomes on the best farms were not due entirely to advantages in one factor, as price of farm products for instance, but rather to a combination of advantages. A careful selection and apportioning of crop and livestock enterprises, crop yields, quality of livestock kept, and the managerial ability and industry of the farmers contributed their share toward the higher incomes.

The higher prices received for practically all of the farm products sold was one of the most important factors in the net results of the farmers with the highest incomes. These farmers, on the average, received the following price advantages over the 10 farmers with the poorest returns: Alfalfa hay $6.28 per ton, potatoes $4.34 per ton, wheat $0.61 per bushel, dairy cows $10 per head, brood sows $16 per head, and chickens $0.10 per head. In connection with the price of hay, wheat, and hogs, it must be stated that these prices were partly influenced by these facts: (1) Most of the hay sold, on the high-income farms, was baled at a cost of $2.25 per ton; (2) a large part of the wheat was sold, above the market price, for seed; (3) and many of the sows were purebred, thereby bringing higher prices as breeders.

The selection of crop and livestock enterprises also had much to do with the final results from farming. Price relationships in 1922 were favorable for alfalfa and unfavorable for potatoes. This was important to the success of the best 40-acre farms because they had an average of 20 acres devoted to alfalfa as against 16 acres on the low-income farms. The high-income farms had an average of 0.8 acre less of potatoes. Dairy cows were of about equal importance in number and production on both groups of farms. The 10 best farms had a total of 18 sows as against 10 for the other farms, which helped to account for the much larger returns from hogs sold. Hens were more numerous on the farms with low returns, averaging 66 per farm as against 52 for the best farms, but the quality of the hens was better on the farms with the highest returns. These farms sold an average of 98 eggs per hen, as against 59 for the poorer farms.

Crop yields contributed their share to the success of many farms in this area. The 10 best farms had the following advantages over the low-income farm in crop yields per acre: Alfalfa 26 per cent, potatoes 18 per cent, wheat 110 per cent.

More labor was used by the most successful farmers which is to be expected on account of the greater crop yields. These farmers used an average of 0.8 month more of hired labor and exchanged one-third more labor than the farmers on the low-income farms. The amount of labor contributed during the year by the operator and his family was the same in both cases.

The managerial ability of the operator is often an important factor in determining the size of the income on a farm. This is illus-

trated in the case of one of the 40-acre farmers in this area, who had poor crop yields and yet belonged to the group of 10 farmers with the highest incomes. When this man acquired his farm, it was badly run down on account of careless cropping, and several alkali spots helped to reduce yields considerably on certain fields. Realizing that successful farming was largely dependent upon good yields, this farmer chose and adjusted his enterprises in such a way that the productive ability of the soil to produce crops would be gradually increased. High-quality cows and purebred sows were purchased, and that portion of the land too alkaline to produce fair crops was seeded to sweet clover and used for pasture.

In 1922 this farmer had seven cows and seven purebred sows and raised all but $346 worth of his feed. His purebred hogs, high-producing cows, together with the fact that he sold some of his wheat for seed and worked off the farm occasionally when opportunity afforded, not only put him in the class of the ten 40-acre farmers with the highest farm income, but helped him to build up the productivity of his soil.

SELECTION AND PRODUCTION OF CROPS

In planning and carrying out a good crop organization for a general farm in the Yakima Valley it is well to consider the following questions: (1) Which crops can be grown most economically? (2) What are the marketing possibilities for the different crops grown in the area? (3) How do the different crops vary in their demand upon the farmer's labor and water supply? (4) What practices are used by the farmers who obtain the best yields?

Prices which prevail at the time farm products are sold on the market often determine the relative profitableness of different enterprises during a given year. Severe losses have been experienced by Yakima Valley farmers who plunged in crops that had relatively low prices at the time of marketing. In surplus-producing areas, such as this one, it is very important to consider the marketing program when planning the production program. Some of the more important marketing problems on farms in this area have been discussed previously.

SELECTING CROPS FOR ECONOMICAL PRODUCTION

Fortunately, moisture conditions in the Yakima Valley seldom cause extreme variations in yield for the principal crops grown (Table 18) as these conditions are more or less controlled by irrigation. But considerable variation is noted in yields from field to field on the same farm, or from farm to farm in the area. These differences in yields on the farms, as shown in Table 19, are due moslty to differences in soil conditions, topography of the land, and crop pests or diseases. It is in the control of crop yields that farmers in this area, in common with those in other areas, have one of the best opportunities for reducing costs and increasing net returns from farming.

Just what it means to one of these farmers to increase his crop yield is illustrated in the case of wheat in 1922 (Table 20). In order to have made $30 per acre,[5] for the use of his own and family labor

[5] See footnote, Table 20.

and the use of his land and equipment, he would have needed a price of $1.85 per bushel for a 20-bushel yield or $0.73 per bushel for a 60-bushel crop. It is the farmer with comparatively low yields who needs to make special efforts to increase his yields, as it usually costs less and is more profitable to raise a low yield to a medium yield than to raise a medium yield to a very good yield.

TABLE 18.—*Crop yields on Sunnyside division of Yakima project, Washington, and on farms studied*[1]

Year	Alfalfa	Potatoes	Wheat	Oats	Barley	Sugar beets	Corn, grain	Corn, silage
	Tons	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Tons*	*Bushels*	*Tons*
1913	5.0	264	(2)	(2)	(2)	(3)	50	(2)
1914	5.0	230	(2)	(2)	(2)	(3)	53	(2)
1915	4.0	217	20	60	32	(3)	60	(2)
1916	4.8	223	20	40	38	(3)	48	12
1917	4.5	232	20	44	31	10.0	47	15
1918	4.3	211	20	40	28	5.0	50	11
1919	4.2	203	26	60	27	10.0	47	10
1920	4.2	257	53	46	28	15.0	42	10
1921	4.2	300	28	52	29	5.0	36	12
1922	4.0	267	35	48	26	5.3	44	20
1923	4.0	237	29	51	26	2.1	43	13
Av. 1919–1923	4.1	253	34	51	27	7.5	42	13
Av. 1921 and 1922 on farms studied	4.6	320	41	53	36	7.4	50	9

[1] Compiled from annual reports of the U. S. Bureau of Reclamation.
[2] Yields not recorded.
[3] Sugar beets were not grown commercially in the valley prior to 1917.

TABLE 19.—*Variation in crop yields on farms studied, 1921 and 1922*

Crop and yield per acre	Farms producing specified yields		Crop and yield per acre	Farms producing specified yields	
	1921	1922		1921	1922
Alfalfa:	*Number*	*Number*	Potatoes:	*Number*	*Number*
6 tons and over	11	16	15 tons and over	2	8
5 to 5.9 tons	33	43	12 to 14.9 tons	12	27
4 to 4.9 tons	38	56	9 to 11.9 tons	39	47
3 to 3.9 tons	24	20	6 to 8.9 tons	37	39
Less than 3 tons	5	3	Less than 6 tons	9	6
Total	111	138	Total	99	127
Average yield per acre	4.6	4.7	Average yield per acre	8.9	10.3
Wheat:			Sugar beets:		
55 bushels and over	8	8	10 tons and over	1	1
40 to 54 bushels	18	15	5 to 9.9 tons	2	1
25 to 39 bushels	11	21	Less than 5 tons	5	1
Less than 25 bushels	5	13	Total	8	3
Total	42	57	Average yield per acre	4.0	10.7
Average yield per acre	43	39			
Corn for grain:			Rutabagas:		
75 bushels and over	2	18	20 tons and over	5	2
60 to 74 bushels	8	18	15 to 19.9 tons	1	4
45 to 59 bushels	8	17	10 to 14.9 tons	10	12
30 to 44 bushels	24	9	5 to 9.9 tons	1	5
Less than 30 bushels	7	8	Less than 5 tons		1
Total	49	70	Total	17	24
Average yield per acre	41	58	Average yield per acre	13.7	12.5

TABLE 20.—*Effect of wheat yields upon the price needed to return $30*[1] *per acre for the use of family labor, land, and equipment, 1922*

Item	Yield per acre (bushels)				
	20	30	40	50	60
Cash labor cost for binding and threshing ..... dollars..	4.30	5.20	6.10	7.00	7.90
Cash material cost for seed, sacks, and twine ..... do....	2.65	3.42	4.20	4.98	5.75
Price per bushel needed to return $30 per acre for "other costs" in addition to those above[2] ..... dollars..	1.85	1.29	1.01	.84	.73

[1] The $30 assumed for "other costs" approximately covers the amount of these costs in producing an acre of wheat. The cash labor and material costs for each next higher yield is computed by adding to the preceding costs the extra costs of labor and materials for each additional 10 bushels of wheat. The price per bushel needed to return $30 per acre for "other costs" is computed as follows: Add extra labor costs ($4.30), extra material costs ($2.65), and $30 per acre for "other costs." Divide this sum by the yield (20 bushels) which gives $1.85 for the price needed for the 20-bushel yield given in the first group.
[2] "Other costs" are value of operator's and family labor and use of land and equipment.

The possibility for the economical production of a crop on an individual farm is often determined by the quality and uniformity of the soil. A farmer needs to know just what crops and yields the soil in each part of his field is capable of producing. That portion of the farm that has an excess of alkali or is infested with crop pests should be planted to crops which have the best chance of surviving these difficulties, until they can be overcome. Rutabagas, squash, fall wheat, and sweet clover seem better able to withstand alkali soils than the other crops. Such soils often make excellent pastures, and it is possible that in many cases this is the best way to use and improve alkali soils or those infested with crop pests.

Having inventoried the crops it is possible to grow on an individual farm, the next steps to consider are which crops to select and how to combine them into a cropping program. Crops are produced primarily for two purposes: (1) To be sold on the market or fed to livestock and (2) to maintain or increase the soil fertility. The crop organization best suited to an individual farm will depend considerably upon the condition of the soil, available markets, and the fitness of the operator to conduct the various enterprises successfully.

On the farms where the soil is uniform, productive, and suitable for growing the principal crops of the area, and where suitable markets for the sale of these crops are available, it is usually not necessary, and is considered poor business, in many individual cases, to keep more livestock than can profitably utilize the wastes from the tables and crops. Although it is likewise unnecessary, under similar conditions, to devote a large part of the crop area to crops which are grown mainly to improve the fertility of the soil, some sort of cropping system should be followed which will permit the most economical utilization of the land over a long period of years. This usually means the use of a crop rotation.

On the averaged-sized farms in this area it is considered good practice by many of the best farmers to keep about half of the land in alfalfa each year, rotating the fields so that the land will remain in alfalfa about four years, followed by a cultivated crop for two years and then a grain crop seeded back to alfalfa.

The marketing outlook should be an important factor in deciding which cash crops to grow on land set aside each year for cultivated

crops. Potatoes will usually be given the preference, as the area is noted for its high yields of potatoes of superior quality. This crop also does particularly well after alfalfa. From one-eighth to one-fourth of the crop area in potatoes each year seems to be about the right proportion on the average-sized farms of this class. Wheat will usually be preferred as the grain crop, as it produces a larger value per acre and costs no more to produce than the other small grains.

On farms where the soil lacks uniformity and the cost of production is increased by the lower yields, it is usually necessary to keep more livestock and devote more land to such soil-building crops as alfalfa and sweet clover, because good crop yields are essential to economical production. The kind and number of livestock to keep will depend upon the otherwise idle and waste resources available for farm use, and upon the fitness of the operator to conduct successfully the various kinds of livestock enterprises. This is discussed more fully in a following section.

CROPS VARY IN DEMAND UPON FARMER'S SUPPLY OF LABOR AND IRRIGATION WATER

The amount of labor used in crop production on Yakima Valley farms varies considerably for the different crops, as shown in Table 21. About 100 hours of man labor, on the average, was used to produce and harvest 1 acre of potatoes. With the same amount of labor, a farmer can produce and harvest about 3 acres of alfalfa, from which three cuttings are removed, or 4 acres of small grain. Potatoes and rutabagas require considerably more time for marketing.

Even for each crop much variation is observed in the amount of labor that different farmers use (Table 22). To produce an acre of alfalfa hay, from 15 to 60 hours of man labor was used, most farmers using between 30 and 40 hours. Similar variations are noted in the production of potatoes and other crops. These variations are largely due to differences in yield, equipment used, size, shape, and topography of fields, and differences in the number of operations necessary to prepare the seed bed and care for the crop and harvest it.

TABLE 21.—*Average amount of labor used per acre for principal crops, Yakima County, 1921*

Crop	Reports	Average yield[1]	Hours of labor used per acre					
			Production and harvesting		Marketing[2]		Total	
	Number	*Tons*	*Man hours*	*Horse hours*	*Man hours*	*Horse hours*	*Man hours*	*Horse hours*
Potatoes	111	9.4	99.7	103.2	[3]12-23	31.2	134.7	134.4
Rutabagas	18	13.3	125.8	75.5	17.1	23.5	142.9	99.0
Sugar beets	21	8.1	91.3	66.8	7.7	18.4	99.0	85.2
Alfalfa	133	4.5	33.8	34.5	6.3	14.4	40.1	48.9
Corn for silage	5	13.0	71.5	80.7			71.5	80.7
Squash	6	12.0	41.2	56.1	9.0	11.0	50.2	67.1
		Bushels						
Corn for grain	30	47.0	43.7	65.5			43.7	65.5
Wheat	68	41.5	26.1	48.1	1.8	4.2	27.9	52.3
Oats	9	51.0	29.3	57.5	1.5	3.3	30.8	60.8
Barley	23	50.0	25.3	45.0	2.8	6.9	28.1	51.9

[1] The average yield is for enterprises reporting.
[2] The average time used in marketing commercial yield from one acre.
[3] The average time used in sorting potatoes in cellar. This varies considerably, depending upon the condition of the potatoes at the time of sale.

TABLE 22.—*Variation in labor used per acre in producing alfalfa and potatoes, 1921*

Crop	Man labor		Horse labor		Crop	Man labor		Horse labor	
	Amount used per acre[1]	Farmers using specified amount of man labor per acre	Amount used per acre	Farmers using specified amount of horse labor per acre		Amount used per acre[1]	Farmers using specified amount of man labor per acre	Amount used per acre	Farmers using specified amount of horse labor per acre
	Hours	*Number*	*Hours*	*Number*		*Hours*	*Number*	*Hours*	*Number*
Alfalfa	15 to 19	1	15 to 19		Potatoes	40 to 59	1	40 to 59	4
	20 to 24	12	20 to 24	9		60 to 79	4	60 to 79	19
	25 to 29	19	25 to 29	19		80 to 99	8	80 to 99	26
	30 to 34	35	30 to 34	34		100 to 119	21	100 to 119	30
	35 to 39	38	35 to 39	30		120 to 139	28	120 to 139	18
	40 to 44	14	40 to 44	23		140 to 159	15	140 to 159	4
	45 to 49	9	45 to 49	11		160 to 179	15	160 to 179	6
	50 to 54	3	50 to 54	3		180 to 199	7	180 to 199	3
	55 to 59	2	55 to 59	2		200 to 219	3	200 to 219	0
	60 to 64		60 to 65	2		220 to 239	7	220 to 239	0
						240 to 259	2	240 to 259	1

[1] Does not include baling alfalfa or hauling crop to market.

A large part of the labor on some crops must be performed in a short period. Even though the total amount of regular labor available during a given period is more than sufficient to meet the total needed by crops, it is often necessary or to the advantage of the farmer in this area to hire, and exchange for certain crop work. For instance, during the potato harvest, it is necessary to hire enough men to keep up with the digger. Some potato growers find it to their advantage to hire all the digging and picking, for the same reason that much of the threshing is hired in a grain-producing area. It is a common practice to hire or contract the blocking and thinning of sugar beets and rutabagas unless a large surplus of regular labor is available when these operations must be performed. Even though a farmer in this area has considerable regular labor available during the 10-day period for harvesting or for cutting of alfalfa, it would be a very unwise and uneconomical practice to spread the harvest over the entire period to avoid the hiring of extra labor. Alfalfa must be harvested within a very short period if the leaves are to be saved and good color preserved. The leaves are about equal to wheat bran in feeding value.

The amount and cost of extra labor needed on certain crops is an important factor in the net returns from crop enterprises, especially when yields and prices are uncertain. Some farmers in this area are able to reduce considerably their cash expenses for extra labor by joining hay and potato-harvesting crews and in this way exchange for much of the extra labor needed. Table 23 shows the crop operations which usually require more than one man and other operations often hired by operators of family-size farms. The average crew used and the normal rate per day are also given.

The best time for performing field operations should be considered by an irrigation farmer when he plans his crop program. His final results from crop enterprises are determined largely by well-performed operations, done at the right time, and the timely application of water. Harvesting alfalfa calls for the entire time of the

farmer for a comparatively short period, if best results are to be obtained; many of the other crop operations can be performed over a longer period. According to the experience of many farmers in the area, potatoes, corn, and small grains depend largely for their success upon getting water at certain stages in their development. Some of the other crops are not so exacting in their demands for water at a particular time. Often hiring labor can be measurably avoided by knowing when and how to make little adjustments in crop operations. It is therefore to the best interest of the farmer that the peculiarities and needs of each crop be known in order that the efficient use of the farm labor and water supply may be planned in advance.

TABLE 23.—*Crop operations usually requiring more than one man and other operations often hired by operators of family-size farms*

Crop and operation requiring more than one man	Crew commonly used		Accomplished per day	One-man operation often hired
	Men	Horses		
Potatoes:	*Number*	*Number*	*Acres*	
Picking	8		2½ to 3	Dig.
Hauling to cellar	2	2	2½ to 3	Haul to market.
Sorting in cellar[1]	4		8 tons	
Sugar beets (8-ton yield):			*Acres*	
Blocking and thinning[1]	4		1½ to 2	Hoe.
Topping and loading	2		1½ to 2	Haul.
Rutabagas (10-ton yield):				
Blocking and thinning[1]	4		1½ to 2	
Topping and piling	3		1 to 1½	
Sacking	3		1 to 1½	Haul to market.
Alfalfa: Stacking[1]	8	8	17 to 20	Mow. Shock. Haul to market.
Small grain:				
Stacking[1]	2	2	4 to 5	Bind.
Threshing from stack[1]	4		17 to 20	Shock.
Corn silage (12-ton yield): Filling silo[1]	6	4	2 to 2¼	Bind.

[1] Operator is included in crew.

Figure 9 illustrates the variations in the seasonal limits in which operations for the principal crops can be performed to the best advantage. As will be seen from the illustration, the time limits for some operations are considerably shorter than for others. The hay harvest, for instance, is limited to about two weeks, but the rutabaga harvest can be extended over a two-month period.

Operations for some crops compete for the farmer's time, as will be seen from a study of the same diagram. The labor requirements for any combination of crops can be calculated, conflicts measurably avoided, and the labor peaks reduced by carefully planning the cropping system and apportioning in advance the time to be devoted to different operations. When considerable spring planting is contemplated, much of the spring work can be avoided by plowing part of the land in the fall. This also helps to get spring crops in at the time they have the best chances for success.

Water is the limiting factor of plant growth in most irrigation regions. Because the successful application of water depends so much upon the crops grown, the texture and topography of the land, the

season of the year and the maturity of the plant, it is difficult to discuss water requirements of plants and their effect upon the choice of enterprises for an individual farm, except in the most general terms. Owing to the different conditions existing on farms, what might be good irrigation advice for one farm might prove to be unwise for another. Each farmer therefore needs to study the water requirements for the different plants which are grown under the various soil conditions existing on his farm.

Plants vary in their needs for water. Pastures and new seedings of alfalfa will require more moisture to maintain a successful growth than barley or wheat, for instance, which are grown under similar conditions. Good yields of wheat are produced on less water than is required by oats.

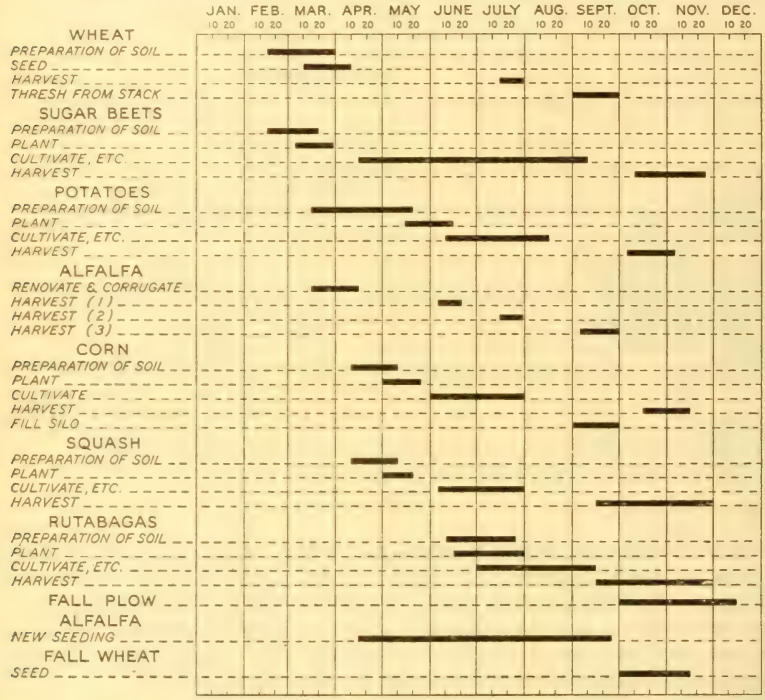

FIG. 9.—Usual range for the performance of principal field-crop operations in Yakima County

The texture of the surface soil and subsoil and the topography of the land are important factors to be considered in applying water to crops. Sandy, shallow soils require light, frequent irrigations, whereas deep clayey soils can be irrigated less frequently with heavy applications. Light frequent irrigations are needed on very sloping lands to prevent washing and give the soil an opportunity to absorb moisture.

The season of the year and the maturity of the plant have much to do with the application of water. More water is needed during the hot summer and windy periods to overcome losses from evaporation.

Plants which are sufficiently developed to shade the ground partially or completely are much easier to irrigate, because there is less baking and evaporation.

Selecting and apportioning enterprises on an irrigated farm should not be attempted before the water demands of the different crops and soils and the seasonal water supply have been carefully considered. On farms where the available water supply is likely to give out or become greatly reduced in the latter part of the season a part of the farm area should be devoted to crops which mature early and require an abundance of water when a good supply is available.

UNIT REQUIREMENTS OF CROP PRODUCTION AND METHODS USED IN OBTAINING GOOD YIELDS

Many farmers in the Yakima Valley will be aided in the selection and production of crops by a study of the seasonal distribution of crop labor and by a knowledge of crop practices which have proved highly successful in the area. The charts and tables [6] for each important crop will assist farmers in estimating the labor requirements for various combinations of crops in advance. This will make it possible to calculate the peak loads of labor more accurately, and to shift the work on some enterprises and thereby keep the amount of hired labor to a minimum. The extra material requirements for the production of each crop are given in order that these costs may be considered along with the costs for labor. Methods and practices used by farmers who have a reputation for producing crops economically in the area are also discussed. These practices should be especially helpful to the newer settlers in the Yakima Valley, and they will, in many instances, assist longer established farmers in obtaining more economical crop production.

ALFALFA

Alfalfa hay is the most important field crop grown in the Yakima Valley. It is grown by practically all farmers and on the average occupies about half of the total crop area on the general farms. It furnishes a large part of the cash receipts from farming.

Three cuttings are usually obtained. The second (see fig. 10), which comes during the latter part of July, is mowed and stacked in the shortest time, on account of the extremely dry weather. If possible, the crop is mowed in the morning and raked and shocked in the afternoon. Not over three days are spent in this operation from the time the alfalfa is mowed until it is stacked. The very dry weather and the tenderness of the leaves and small stems render it highly important for farmers to make special efforts to save the leaves and preserve the green color, if hay of the highest quality is to be produced. Usually small shocks of about a large forkful each, are made (fig. 11). This reduces the amount of handling necessary and permits the green, moist hay to dry in the shock. A few farmers advise making larger shocks, even at the extra cost of labor, maintaining that a better quality of hay results.

[6] Besides the unit requirements in hours of man and horse labor needed per acre, the quantities of seed, sacks, and other materials required for production are given for each crop and the equipment used in obtaining the rates for the performance of the different operations. These rates are those attained by the best farmers and are a little above the average for all farmers. Since all farmers do not perform the same number of operations on the same crop, only the principal operations performed by most farmers are given. Adjustments for variations from these operations on individual farms can readily be calculated and added to, or subtracted from, those given in the tables. The farm practices given for each crop were obtained from farmers in the area who have been particularly successful in obtaining high yields of good quality.

Much of the extra labor needed, in order to put up the hay quickly, is supplied by the farmers themselves. Several of them form a hay crew and help to put up each others' hay. This method of exchanging labor should be encouraged, as it reduces expenses and makes available experienced and reliable labor.

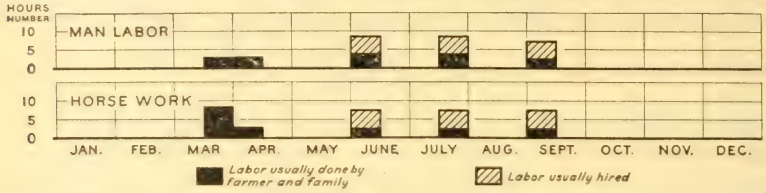

FIG. 10.—Distribution of labor for principal field operations on 1 acre of alfalfa by half-month periods[1]

CONDITIONS

Yield: 5 tons per acre.
Equipment used: 6-foot spring-tooth harrow and three horses; 8-foot spike-tooth harrow and 2 horses; ditcher and 2 horses; 5-foot mower and 2 horses; 10-foot rake and 2 horses; 2 sleds and 4 horses; stacker.
Material requirements per acre.———

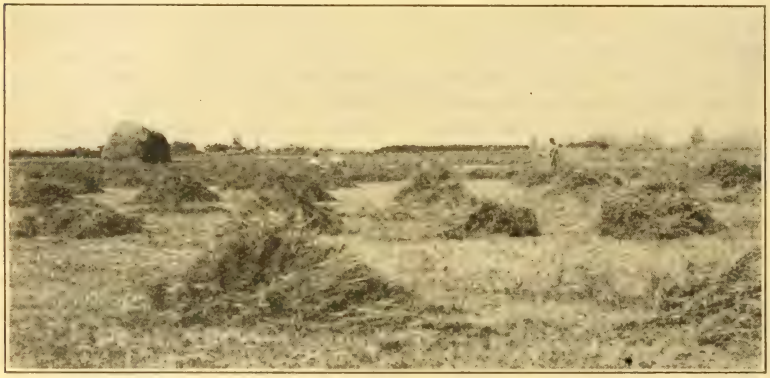

FIG. 11.—The alfalfa hay is raked and made into small shocks soon after cutting. This saves a large portion of the leaves and small stems because of less handling and slower drying

On account of the low rainfall and dry climate, the hay is stored outside in stacks, and baled when sold. Carefully made stacks not only are a pride to the farmer, but they considerably reduce the waste from weathering.

[1] The data from which this chart was made, as well as other information on the principal field operation for alfalfa, appear in the following table:

Item	Unit	Renovate	Corrugate	Irrigate	Mow	Rake and bunch	Shock	Stack
Times over	Number	2		3	3	3	3	3
Rates per day	Acre	7	7		8	16.	7	
Man labor per acre	Hour	2.8	1.4	4.5	3.6	1.8	4.2	12
Horse labor per acre	do	8.4	2.8		7.2	3.6		12
Date performed	Usual two-week period.	Mar. 16 to 31.	Apr. 1 to 15	Apr. 1 to July 31.[a]	(1) June 1 to 15; (2) July 16 to 31; (3) Sept. 1 to 15.			

[a] As soon as water is available in the spring and immediately after the first and second cuttings.

At least three irrigations are necessary in this area for alfalfa. The first comes as soon as the water is turned into the irrigation canal in the spring, and the second and third irrigations come immediately after the first and second cuttings. If the land is nearly level, the furrows are recleaned after each cutting.

Under existing conditions the increased yields as the result of cultivation of alfalfa fields apparently justify the additional expense involved.

A spring-tooth and a spike-tooth harrow are desirable for renovating alfalfa. The land is first gone over vigorously with the spring-tooth harrow, followed by a smoothing over with a spike-tooth. Renovating alfalfa is done in the spring after the weeds are far enough along to destroy effectively. First-year alfalfa is not renovated, as the roots will not stand it.

Seeding alfalfa.—These farmers have a long period in which to establish a new field of alfalfa. From the time irrigation water is available in the spring until about September 15 is a good time to seed. A nurse crop is generally used for spring and fall seeding, but late summer seeding is done without a nurse crop. Those who prefer summer seeding claim that the seed starts quicker, because the soil is warmer and fewer weeds are encountered. Considerable water however must be available for seeding at this time. On light soil inclined to blow, seed is usually sown in the fall, or corn is planted in the spring.

Any of the small grains can be used for a nurse crop, although wheat is generally preferred because its value per acre is greater. On the lighter soils, where very heavy irrigation is essential to get the alfalfa to grow, oats sometimes make a more profitable nurse crop because it responds more favorably to the excessive application of water. When small grain is used as a nurse crop, about one-third less grain is used than when the grain is seeded alone.

Seeding alfalfa at the rate of 8 to 12 pounds per acre on a well-prepared seed bed gives the best results. Most farmers prefer seeding broadcast. Any of the well-known varieties of seed is satisfactory. Grimm is hardier, but in this area there is little danger of winterkilling; therefore this variety is not grown extensively, as the yields are somewhat less than for the other varieties.

New seedings of alfalfa need about twice as much water as older alfalfa. It is therefore advisable to plan the new seeding so that it will come at a time when the most water can be spared from the other crops.

POTATOES

Unusually good yields of high-quality potatoes, and in most cases satisfactory prices, have made this crop an important source of cash income on many farms in the Yakima Valley. Besides fitting well in the cropping system, potatoes do not compete seriously with other important crops for the farmers' time. (See fig. 12.) On farms of less than 80 acres, where not over 10 or 15 acres of potatoes are grown, the farmer and his family can do practically all of the work until digging. After the other crops are planted in the spring, there is plenty of time to plant potatoes, and digging comes after most of the other crops are harvested.

Potatoes often follow alfalfa in the cropping scheme. When this is the case, the alfalfa is plowed very shallow or "crowned" during the fall or early spring, the latter being the common practice. After the alfalfa is crowned, it is gone over with a disk or spring-tooth harrow and then allowed to lie until time for planting. Just before planting the ground is plowed again, this time from 8 to 10 inches deep. To conserve moisture, it is recommended that the ground be harrowed not over four or five hours after it has been plowed.

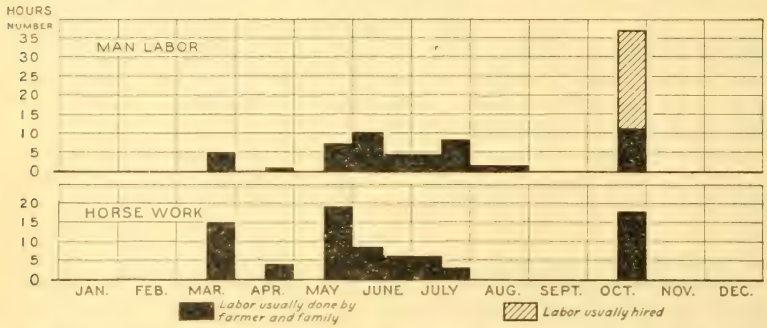

FIG 12.—Distribution of labor for principal field operations on one acre of potatoes by half-month periods[1]

CONDITIONS

Yield: 9 tons per acre after alfalfa.
Equipment used: 14-inch 2-way plow and 3 horses; 8-foot disk and 4 horses; 8-foot spike-tooth harrow and 2 horses; 1-man planter and 2 horses; 1-row cultivator and 2 horses; digger and 4 horses.
Material requirements per acre: 900 pounds seed, 174 sacks, 1.4 pounds twine.

Good strong seed potatoes should be used. Potatoes brought from outside the Yakima Valley are recommended because they produce better stands and are less liable to disease. The most successful growers are now planting 1,000 pounds per acre instead of 800 pounds as formerly. They are planting closer in the row and are planting larger pieces. Closer planting produces more potatoes of the desirable market size and the larger pieces give the young plant a better chance against insufficient moisture in the soil. Later planting is

[1] The data from which this chart was made, as well as other information on the principal field operations for potatoes, appear in the following:

Item	Unit	Crown alfalfa	Disk	Corrugate	Plow	Harrow	Cut seed	Plant
Rates per day	Acres	2	10	7	2	15	-------	3.5
Man labor per acre	Hour	5	1	1.4	5	.7	6	2.9
Horse labor per acre	do	15	4	2.8	15	1.4	-------	5.8
Dates performed	Usual 2-week period.	Mar. 1 to 15.	Apr. 1 to 15.	May 16 to 31.			June 1 to 15.	

Items	Unit	Harrow	Cultivate and hill	Hoe and weed	Irrigate	Dig	Pick	Haul to cellar
Times over	Number	2	5	----------	6	-------	-------	-------
Rates per day	Acres	15	6	2.5	1.5	3	3	3
Man labor per acre	Hour	1.4	8.5	4	9	3.3	26	8
Horse labor per acre	do	2.8	17.0	----------	----------	9.9	-------	8
Dates performed	Usual half-month period.	June 1 to 15.	June 16 to July 31.	July 16 to 31.	June 16 to Aug. 31.	October 16 to 31.		

becoming more popular with many growers, because it tends to produce smoother potatoes and there seems to be less trouble with disease.

Alfalfa has first claim on the farmers' time, but potatoes occupy the same position in their demand for water. The success of the potato crop is largely determined by the water it gets when it needs water most. Probably the most important of such periods is just before the plants begin to bloom when the young potatoes are beginning to form. The soil usually contains enough water to carry the potato crop to the blooming stage without suffering from the lack of it. The number of later irrigations depend a good deal upon the moisture-holding capacity of the soil. The last irrigation usually occurs the last week in August or first week in September. A uniform soil-moisture condition is essential to good yields of well-shaped potatoes. According to irrigation experiments with potatoes in Utah,[7] excessive irrigation, or that applied later in the life of the

FIG. 13.—Soil and weather conditions in the Yakima Valley are ideal for large yields of high-quality potatoes

plant, increased the relative production of vines. The relative number of tubers to the hill was increased by early irrigation, whereas the relative size of the tubers was influenced more by late water.

Potatoes are not harvested until a week or two after the first killing frost. Harvesting is done by means of a standard digger similar to the one shown in Figure 13. About 3 acres is a good day's work for such an outfit, and from 7 to 10 pickers are required to keep up with the digger.

Care must be exercised in storing potatoes. Bruising potatoes in handling tends to promote disease.

RUTABAGAS

Rutabagas are a comparatively new commercial crop in the Yakima Valley. Good yields are produced and when favorable markets can be found the crop is profitable.

[7] Utah Agr. Exp. Sta. Circular No. 46.

Because rutabagas are not planted until after all other crops are in (fig. 14), they occupy a peculiar place in the crop organization of these farms. They can be used to replace crops which have failed (fig. 15) or as a second crop, following pasture or small grain. Rutabagas do comparatively well on land too alkaline for other crops. The labor on rutabagas comes at a time when it can often be fitted into the cropping system without disturbing the time needed by the other crops.

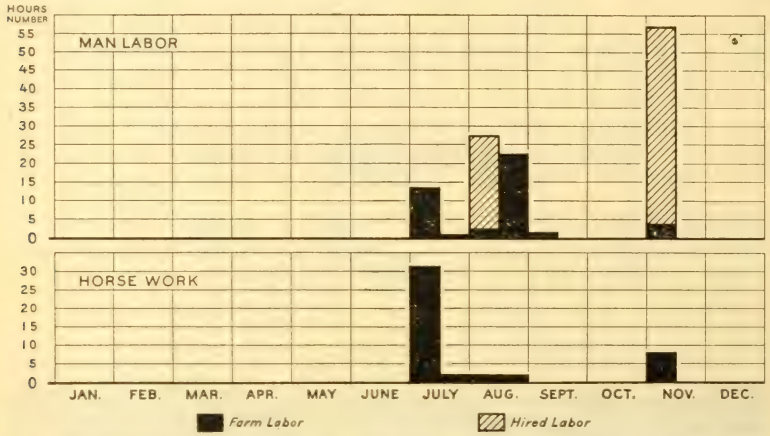

FIG. 14.—Distribution of labor for principal field operations on 1 acre of rutabagas, by half-month periods[1]

CONDITIONS

Yield: 12 tons per acre.
Equipment used: 14-inch 2-way plow and 3 horses; 6-foot spring-tooth harrow and 3 horses; 8-foot spike-tooth harrow and 2 horses; 6 foot by 12 foot float and 3 horses; 4-row planter and 2 horses; 4-row cultivator and 2 horses; beet lifter and 2 horses.
Materials: 2 pounds seed, 225 sacks, 1.8 pounds sack twine.

Following are some of the more important cultural practices used by one of the most successful rutabaga growers in the Yakima Valley: Land selected for rutabagas should not be too rich or the plants will grow too rank and the quality be reduced. For this reason rutabagas do not follow alfalfa, but usually some other cultivated crop or some grain crop. In the fall, this farmer seeds rye for pasture, which gives good pasture until June 15, or he seeds beardless barley

[1] The data from which this chart was made, as well as other information on the principal field operations for corn, appear in the following table:

Item	Unit	Plow	Harrow[a]	Float[b]	Corrugate	Plant	Cultivate	Block and thin	Irrigate[c]	Hoe[d]	Pull	Top and pile	Sack
Times over	Number	---	3	2	---	---	3	---	0.4	2	---	---	---
Rate per day	Acre	2	15	8	7	9	10	0.4	---	1	2.5	---	---
Man labor per acre	Hour	5	2.1	2.4	0.7	1.1	3	25	---	20	4	28	25
Horse labor per acre	do	15	4.2	7.2	1.4	2.2	6	---	6.0	---	8	---	---
Date performed	Usual 2-week period.		July 1 to 15.				July 16 to Aug. 31.	Aug. 1 to 15.	Aug. 1 to Sept. 15.	Aug. 16 to 31.	Nov. 1 to 15.		

[a] Two harrowings are after first irrigation.
[b] Second floating just before planting.
[c] One irrigation before planting.
[d] First hoeing, 14 hours; second 6 hours.

early in the spring. Barley is given a light irrigation before it starts to head and another light irrigation when in milk. The barley is cut and bound about July 1. If the stubble is too high, it is mowed and raked and taken off for stock to turn into manure in the corral.

This man plows the ground about July 8 or 10. If it turns up lumpy, it is harrowed, but generally it is just floated. It is then ditched out with a 4-row beet cultivator and irrigated. It is allowed to dry into good working shape and is then harrowed into good condition for planting, ditched, marked with 4-row cultivator, and drilled. The ditching prevents the young plants from burning off when they come up and provides for early irrigation if necessary. In order to assure a full crop, in this area this man recommends planting between June 15 and July 20. This farmer plants 2 pounds per acre of King of Swedes or American Purple Top in rows 22 inches

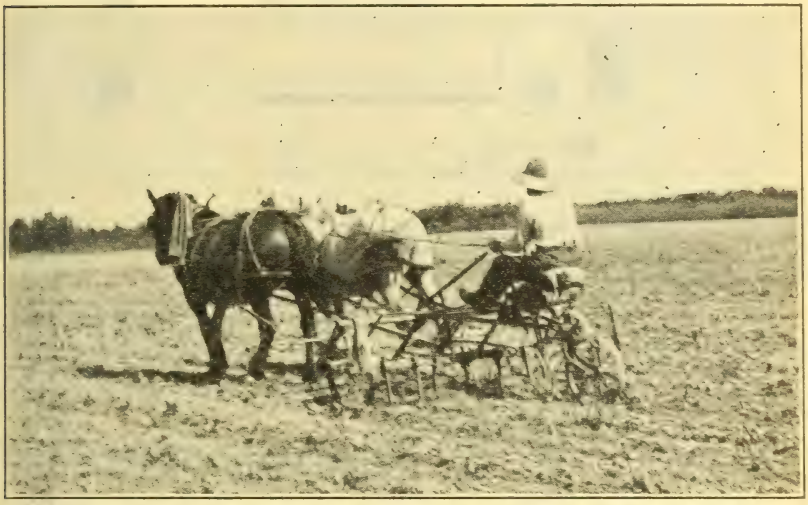

FIG. 15.—The crop of sugar beets on this farm was a failure on account of disease and the land was replanted to rutabagas about August 1. The four-row duck-foot cultivator saves much labor on farms growing sugar beets or rutabagas

apart. He cultivates as soon as possible, usually when the third or fourth leaf appears, and thins to 8 to 10 inches. He cultivates again in about 10 days, ditches, and irrigates if ground needs irrigating. Then he cultivates about every week or 10 days until plants become too large for cultivation. He irrigates about three times, the last time around September 15. Harvesting takes place between September 15 and November 1, depending somewhat upon the market price, and can easily be so adjusted that it will not interfere with the harvesting of other crops.

SUGAR BEETS

It is unfortunate that sugar-beet growing has not been attended with more success in this area. The dependable market furnished by the local sugar mills gives this crop an advantage which can not be claimed by the other field crops. (See fig. 16.)

The principal difficulty encountered in the growing of sugar beets, since its introduction into the valley in 1917, has been a disease called curly top, which is caused by insect infection due to migrations of the carrier insect (*Eutettics tenella*). When a plant has developed full-grown leaves at the time of infection, these leaves continue to function, and only the younger leaves show signs of the disease. For this reason earlier planted beets always produce the best crop.

As sugar beets are a new crop to most of the farmers in this area, they have not always been given the care and attention which brings

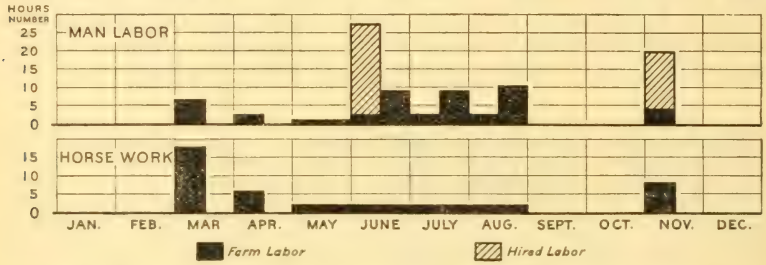

FIG. 16.—Distribution of labor for principal field operations on 1 acre of sugar beets [1]

CONDITIONS

Yield: 9 tons, after cultivated crop.
Equipment used: 14-inch 2-way plow and 3 horses; 6-foot spring-tooth harrow and 3 horses; 8-foot spike-tooth harrow and 2 horses; 6-foot by 12-foot float and 3 horses; 4-row beet drill and 2 horses; 4-row cultivator and 2 horses; beet lifter and 2 horses.
Material requirements per acre: 15 pounds seed.

out their best possibilities. Those who have been most successful with beets have selected the soil with care, fall-plowed the ground, and seeded very early the following spring. The land has been well cultivated and irrigated throughout the season. Good potato ground, if not too sandy, is good beet ground.

Every possible means should be encouraged to overcome the difficulties which stand in the way of profitable sugar-beet production, because of its possibilities, in stabilizing returns from field crops and its adaptability to a place in the cropping system. The sugar-beet acreage on each farm should be limited to that which the operator can prepare well and cover with barnyard manure.

[1] The data from which this chart was made, as well as other information on the principal field operations for sugar beets, appear in the following table:

Item	Unit	Plow	Harrow	Float	Plant	Cultivate	Irrigate	Block and thin [a]	Hoe	Lift	Top and load [a]
Times over	Number		2			8	4		3		
Rate per day	Acre	2	15	8	9	10		0.4	1.2	2.5	
Man labor per acre	Hour	5	1.4	1.2	1.1	8	6	25	24	4	16
Horse labor per acre	do	15	2.8	3.6	2.2	16				8	
Dates performed	Usual half-month period	Mar. 1 to 15.		Apr. 1 to 15.		May 1 to Aug. 31.	June 1 to Sept. 15.	June 1 to 15.	June 16 to Aug. 31.	Nov. 1 to 15.	

[a] Operations usually hired.

The importance of corn production is closely associated with the importance of livestock, because practically all of the corn raised is fed on the farm. The very good yields reported on most farms not infested with wireworms, gives this crop an important place in the crop organization of the general farms in the Yakima Valley. (See fig. 17.)

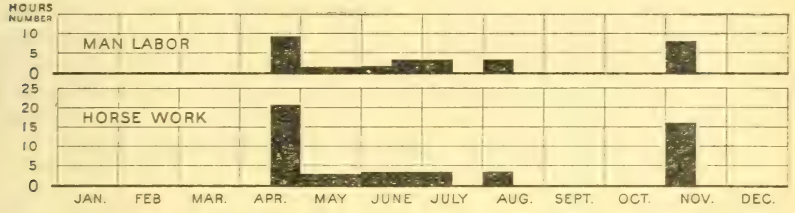

FIG. 17.—Distribution of labor for principal field operations on 1 acre of corn by half-month periods[1]

CONDITIONS

Yield: 60 bushels per acre.
Equipment used: 14-inch 2-way plow and 3 horses; 8-foot spike-tooth harrow and 2 horses; planter and 2 horses; cultivator and 2 horses; ditcher and 2 horses.
Material requirements per acre: Seed, 10 pounds.

Corn usually follows potatoes or alfalfa or may be planted for two successive years. Plowing in the fall is desirable for corn, saving time in working the land preparatory to planting in the spring; and, where the crop follows alfalfa, the crowns or roots have a chance to dry out.

Yellow dent corn is prefered by most farmers for conditions in this area. Planting is usually done between May 1 and June 1.

Thorough cultivation of the corn after it comes up and an understanding of the moisture needs of the plant are essential to the best results. Large quantities of water cause the corn to have relatively less grain, cobs, and leaves and more husks and stalks. It also delays maturity. From two to four irrigations are usually necessary on most of these farms, the last one coming when the corn is beginning to harden.

About a month or more, usually from October 15 to November 15, is allowed for harvesting, permitting the work to be so adjusted that it will not seriously interfere with work needed on other crops.

[1] The data from which this chart was made, as well as other information on the principal field operations for corn, appear in the following table:

Item	Unit	Plow	Harrow	Corrugate	Irrigate	Plant	Harrow	Cultivate	Irrigate	Pick load and haul to crib
Times over	Number	----	2	----	----	----------	2	4	3	----------
Rate per day	Acres	2	15	7	----	7	15	6	----------	1.3
Man labor per acre	Hour	5	1.4	1.4	1.5	1.4	1.4	6.4	4.8	8
Horse labor per acre	Hour	15	2.8	2.8	----	2.8	2.8	12.8	----------	16
Dates performed	Usual half-month period	April 16 to 30				May 1 to 15	May 16 to 31	June 1 to Aug. 15	Every 4 weeks June 16 to Aug. 16	Nov. 1 to 15

SMALL GRAINS

The small grains all require about the same amount of labor for production, therefore the particular kind to grow depends largely upon the relative yields and prices of each.

Wheat is grown most commonly of all the small grains. Both winter and spring wheat are successfully grown. Fall seeding usually takes place between October 1 and November 15, and spring seeding between March 1 and April 15. Even for spring planting, which is the common practice, fall plowing is advisable. The frosts help to break up the lumps and save considerable time and labor in getting the seed bed in proper condition. The crop can be sown earlier in the spring and better yields practically always result.

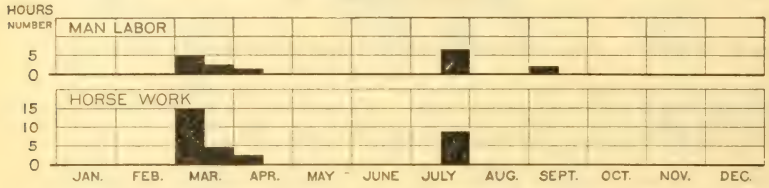

FIG. 18.—Distribution of labor for principal field operations on 1 acre of small grains by half-month periods[1]

CONDITIONS

Yield: 40 bushels per acre.
Equipment used 14 inches 2-way plow and 3 horses; 8-foot spike-tooth harrow and 2 horses; 8-foot drill and 2 horses; ditcher and 2 horses; 7-foot binder and 4 horses.
Material requirements per acre: 1½ bushels of seed; 4 pounds of binder twine; 17 sacks; 9 cents per bushel for threshing.

From one to three irrigations are usually necessary for the small grains on most farms in this area, the number on an individual farm depending upon the type of soil and kind of grain. Delaying irrigation until the plants stool, on lands which maintain a fairly sufficient moisture content early in the season, will help to establish a good root system and insure better yeilds, according to farmers who have followed this practice in the area. Oats can use more water to advantage than wheat.

The Dicklow Jenkins Club varieties of wheat are most commonly grown. The usual rate of seeding is 1½ bushels to the acre.

Irrigated pastures.—Until recently only a comparatively few farmers in this area have realized the possibilities of irrigated pastures.

[1] The data from which this chart was made, as well as other information on the principal field operations for small grains, appear in the following table:

Item	Unit	Plow	Harrow	Drill	Corrugate	Irrigate	Cut	Shock	Stack	Thresh from stack
Times over	Number		2			3				
Acres per day	Acre	2	15	10	7		8	7		
Man labor per acre.	Hour	5	1.4	1.0	1.4	4.8	1.2	1.4	4	2
Horse labor per acre.	Hour	15	2.8	2.0	2.8		4.8		4	
Dates performed.	Usual half-month period.	Mar. 1 to 15.	Mar. 16 to 31.		Apr. 1 to 15.	May 16 to 31; June 1 to 15; July 1 to 15.	July 16 to 31.			Sept. 1 to 15.

The very successful experiments conducted by some of the farmers have demonstrated to the satisfaction of farmers generally that good pastures are one of the most valuable crops in the organization of general farms in this area, even on high-priced lands. The most usual carrying capacity of good pastures on these farms is from two to three cows per acre for seven months.

Aside from the value of pastures for feeding purposes, some pastures, particularly sweet clover, are especially valuable in reclaiming poorly drained alkali soils. Sweet clover will start on alkali land, where alfalfa will not. It not only seems to have the effect of adding humus to the soil but improves the drainage. On alkali soils where artificial methods of drainage have been established sweet clover will help to put the soil in shape for the growing of other crops.

To establish a pasture under irrigation, important preliminary work is necessary. A fine and firm seed bed is prepared in order to provide the most favorable conditions for seed germination and plant growth and also to permit the moisture to spread uniformly through the soil. Spring plowing is made shallow, not over 5 or 6 inches. Fall plowing is generally preferable. Ditches for irrigating are made about 18 inches apart and very shallow, giving just enough depression to keep the water going along in the right direction.

One of the most prolific sources of difficulty in establishing an irrigated pasture is the failure to maintain an optimum moisture condition around the young and tender plants in the early stages of development. Light frequent irrigations are usually necessary. As the plants become older and stronger the quantity and frequency of water applications will depend a great deal upon soil and weather conditions and upon the carrying capacity of the pasture.

Seeding can be done any time between April and October. A light nurse crop can be used, but it is not recommended for most pastures.

The kind of pasture to use depends somewhat upon the soil and kind of stock to be pastured. A general pasture for this area recommended by the extension service of the Washington State College consists of the following mixture per acre:

	Pounds
Kentucky bluegrass	4
Meadow fescue	6
Orchard grass	3
Timothy	2
Alsike clover	4
White clover	1

This combination offers good carrying capacity and a variety of grasses that insure a long pasture season.

A very successful general pasture in this area is shown in Figure 19. This 1-acre pasture, seeded in the late summer, was watered twice after seeding. The following spring, beginning May 10, this pasture carried four cows, besides four horses on Sundays. The operator aims to irrigate every ten days, running the water in overnight.

It is usually desirable to put in cross fences in order that the pasture may have a rest every two or three weeks. This not only prevents the harmful effect of pasturing the land while the ground is wet from irrigation, but gives the plants a chance to make leaf growth

and recuperate from close pasturing. It also provides a more palatable pasture for stock.

Abundant and frequent watering is necessary to get the most out of irrigated pastures.

BENEFITS OF INTELLIGENT PLANNING

Summing up the advantages to be expected from a study and an understanding of the labor and material requirements of different crops, the cultural practices that result in good yields, and the seasonal range for different operations, it can be said that:

1. The efficiency of labor and equipment is increased, enabling the farmer to do a larger business with the available resources on his farm.

2. Some hired labor can be avoided, thereby increasing the farm earnings.

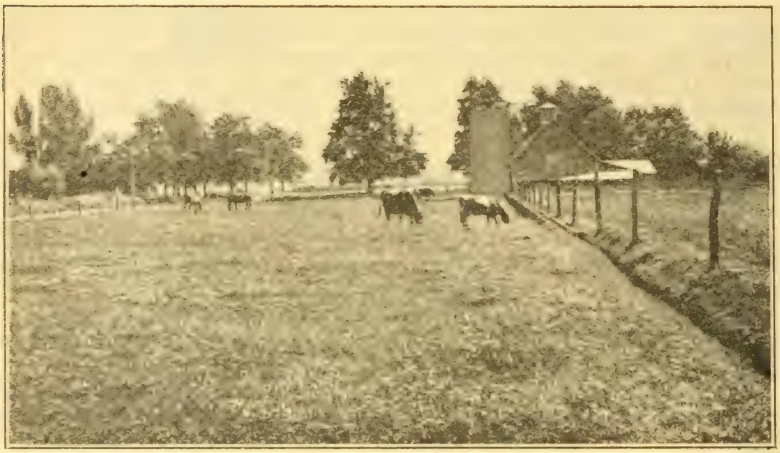

FIG. 19.—This excellent pasture of blue grass, white clover, and timothy was seeded at the rate of 3 pounds each in barley stubble, August 15, after the stubble had been raked and burned, the land disked, harrowed, and ditched. The pasture was irrigated twice in the fall after seeding

3. Crop rotations are encouraged, which in turn help to increase yields.

4. Crop practices best suited to conditions on individual farms are better understood.

5. The farmer is in a better position to calculate in advance his labor and material requirements for different crop operations, which helps him to fit together his crop and livestock enterprises to the best advantage.

SELECTION AND PRODUCTION OF LIVESTOCK

On farms where the climate, soil, and markets are such that the more intensive crops like apples, small fruits, and truck yield high returns, it may be good business to keep only enough livestock to consume the wastes from the table and crops. But on a majority

of alfalfa and potato farms in the Yakima Valley the questions arise whether some livestock can not be kept profitably, what kind to keep, and how much.

SELECTING LIVESTOCK FOR ECONOMICAL PRODUCTION

On farms where it is necessary to grow some soil-improvement crops that can be fed more profitably than they can be marketed, where considerable quantities of low-grade feeds result from the production of the main cash crops, and where cheap or idle labor exists during a large part of the year, the addition of sufficient livestock to utilize those idle or nonmarketable resources, or the greater part of them, is desirable

The important cash products on crop farms in the Yakima Valley are alfalfa hay and potatoes. More or less damaged or low-grade hay and considerable aftermath remain on farms even when hay prices are high. In years when there is a good hay crop throughout the dairy sections of the State, the quantity of hay in the Yakima Valley that can not be disposed of at a profit is often considerable in individual cases. Varying quantities of cull or low-grade potatoes, rutabagas, squash, and other crops occur where these crops are produced for the market. Farmers are justified in keeping some form of livestock to utilize these by-products where they occur in sufficient quantities. Such products are worth to the farmer just what he can get out of them when they become available. The feeding value represented by some of the common waste feeds on Yakima Valley farms is given in Table 24. The good farm manager and the skilled feeder will endeavor to balance livestock rations with these feeds as they become available.

TABLE 24.—*Products often available as feeds on Yakima County farms and their approximate replacement value to farm animals*

Feed	Farm animals to which feed is best suited	Replacement value of feed[1]	Remarks
Apples	Relished by all stock.	For cows: 2½ pounds will replace 1 pound of corn silage. For pigs: 100 pounds=9 to 15 pounds concentrates when fed with shorts and and skim milk.	Being low in protein, apples are successfully fed with high-protein feeds, such as alfalfa, wheat bran etc.
Rutabagas	Sheep, hogs, cattle.	9 pounds=1 pound mixed grain. 2 pounds will replace 1 pound of corn silage.	Preferred by sheep to all other roots Fed before milking may taint the milk of cows.
Potatoes	Hogs, cattle, sheep.	4 to 5 pounds cooked, or 6 pounds raw=1 pound of grain, as partial substitute for grain.	For hogs, for best results, cook and mix with various farm by-products, such as skim milk, corn, barley waste, etc. Unripe potatoes and sprouts of potatoes are injurious to stock.
Squash	Cattle, hogs, sheep, horses.	2½ pounds squash=1 pound good corn silage. Worth about the same as potatoes for fattening hogs.	Corn, squash, and skim milk can be successfully used for fattening pigs. Should be consumed in a short time, as it does not keep.
Skim milk	Young animals, hogs, poultry.	For hogs: 5 to 6 pounds=1 pound grain when properly combined with concentrates.	Most efficient proportion to feed depends upon weight of hogs and relative price. Ranges from 5 parts skim milk to 1 part grain to weanling pigs to 1½ parts to 1 part grain to hogs over 150 pounds.

[1] Compiled from State Experiment Station reports and "Feeds and Feeding" by Henry and Morrison. The feeds except skim milk are fed at the rate of 25 pounds to 40 pounds per 1,000 pounds live weight.

Under present conditions the most profitable way of disposing of many of the low-grade and waste products on these farms is by feeding them to livestock. The class best to keep depends on other factors. If located near a good market for dairy products it may be best to keep dairy cows. The success of the dairy enterprise depends largely on the fitness of the operator to handle cows successfully. If cream is the product sold, the question arises as to the best disposal of the skim milk. Feeding the skim milk to hogs may pay, especially if there is a considerable supply of waste potatoes, rutabagas, and grain on hand.

After deciding to keep dairy cows and pigs, as best suited to fit into the farming scheme, a farmer must decide how extensively to go into these two side lines. Several points must be considered. In many individual cases, where the soil is uniform and productive, where dependable markets are available for the principal cash crops, and where a comparatively small amount of idle or cheap labor exists, it probably will not pay to keep more cattle and hogs than can consume the cheap and low-grade hay, potatoes, and other waste from crops. In deciding upon the number of side lines and how extensively to go into each, the operator should keep in mind the fact that small units are seldom economical unless they utilize cheap family labor or hired labor that would otherwise be unused.

The number of hogs that can be kept to advantage on crop farms in the Yakima Valley depends much upon the available skim milk, waste potatoes, squash, grains, etc. Hogs must make at least a considerable part of their growth from waste or cheap feeds produced on the farm, if they are to be a particularly profitable side line. Good alfalfa pasture, as shown by experiments, helps considerably in reducing the cost of pork production.

Sheep can be used to advantage on some Yakima Valley farms, particularly where considerable hay and pastures are available and where the operator wants to keep livestock but is not well fitted to handle cattle and hogs successfully.

Chickens and turkeys are profitable side lines on these farms. Much of the success of the poultry enterprise depends upon the adaptability and skill of the operator.

LABOR AND MATERIAL REQUIREMENTS OF LIVESTOCK

Much of the "guess" about probable results from livestock enterprises on an individual farm can be removed by an understanding of the feed and labor requirements of the different classes of livestock.

Practically all of the farmers with from four to six cows and a few head of other productive livestock are able to care for the livestock enterprises without additional help. These farmers estimate that such an amount of livestock reduces the time available for other work about two hours a day. So much of the work on livestock, however, comes at a time when there is no work to be done on crops that the additional value of the livestock enterprises, the farmers feel, more than compensates for whatever competition exists between livestock and crops.

The feed requirements for livestock, as shown in Table 25, will assist farmers in this area in apportioning their feed and pasture resources among the different classes of livestock. These require-

ments are based largely upon estimates of farmers in the area and have been reviewed by the department of animal husbandry of the State College of Washington.

TABLE 25.—*Approximate yearly feed requirements for farm animals on Yakima Valley farms*

Stock	Feed	Yearly feed requirement
Work stock (weighing 1,200 to 1,400 pounds)	Grain	1,200 pounds.
	Alfalfa hay	6,000 pounds.
	Pasture	2½ months.
Dairy cows (weighing 1,000 to 1200, pounds; producing 6,000 pounds of 4 per cent milk).	Mixed grain	750 pounds.
	Alfalfa hay	3,500 pounds.
	Corn silage	6,000 pounds.
	Or alfalfa hay (additional)	2,000 pounds.
	Pasture	7 months.
Young dairy stock (average for one calf and one yearling)	Whole milk	150 pounds.
	Skim milk	1,500 pounds.
	Grain	300 pounds.
	Alfalfa	2,500 pounds.
	Pasture	7 months.
Sheep (ewes and rams)	Alfalfa hay	500 pounds
	Corn silage	200 pounds.
	Oats	45 pounds.
	Bran	15 pounds.
	Pasture	8 months.
Sow (with pigs to weaning time, one litter per year)	Corn	1,400 pounds.
	Alfalfa hay	200 pounds.
	Tankage	100 pounds.
	Or skim milk	1,400 pounds.
	Pasture	7 months.
Pigs (weaning time, 40 to 225 pounds)	Corn	710 pounds.
	Tankage	50 pounds.
	Or skim milk	840 pounds.
	Alfalfa pasture	7 months.
Hens, per 100	Oats	1,000 pounds.
	Wheat	2,000 pounds.
	Corn	2,000 pounds.
	Mash	2,000 pounds.
	Milk	1,000 pounds.

ECONOMICAL FEEDING OF LIVESTOCK

In the Yakima Valley alfalfa hay and corn, two of the most important livestock feeds, are produced abundantly and cheaply on practically all farms. Besides these, there are many other cheap or waste feeds that are relished by stock and are worth to the farmer just what he can get out of such feeds when and where they become available. These feeds should therefore play as large a part as possible in the feeding of livestock.

It is a good practice to save the best feeds for stock that are producing milk or being fitted for market. For instance, some dairymen in this area feed their milk cows more alfalfa hay than they will eat in order that the cows may pick out more of the leaves and small stems and leave the coarser material for horses, sheep, or other stock which are merely to be maintained. These alfalfa leaves contain about nine times as much digestible crude protein as the stems and are about equal to bran in total digestible nutrients. When alfalfa hay is very cheap and the price of mill feeds high, it probably is more economical thus to feed more alfalfa hay, allowing the animal to pick out the best, leaving the coarser and less palatable portions of the feed for the stock which is merely to be maintained

Pastures are necessary to economical livestock production even though the price of the land in this area might at first seem prohibi-

tive. Good pastures, according to careful estimates of farmers in this area, will care for from two to three milk cows per acre for seven months, reducing the quantity of hay fed during the pasture season by two-thirds. Pastures are not only economical for all the different classes of livestock produced, but they contribute much to the health and contentment of the animals. Whether or not it will pay to supplement pastures with other feeds must be left to the business judgment of the farmer, based on records. Cows producing heavily will profit by some grain. A small quantity of dry roughage at night is usually desirable for producing dairy cows while on pasture.

The quantity of feed required by different classes of livestock will be determined by the class of animals and whether they are fed for maintenance or production. Animals to be maintained, such as idle work stock and dry cows, need only enough to maintain their bodies without losing weight. The quantity to feed animals for production or those being fitted for market depends a great deal upon the ability of the animal to respond economically to additional quantities of feed. A dairy cow, particularly, must be fed as an individual. She is so contituted that she can digest and assimilate about double the quantity of food necessary to maintain her body.

Sometimes it is difficult to determine which succulent feeds can be produced most economically on a particular farm. This can be partly determined from the replacement value of succulent feeds in Table 24. According to this table, it would require approximately 25 tons of squash or 20 tons of rutabagas to replace the feeding value of a 10-ton yield of corn silage. Knowing this, and knowing requirements of labor, materials, and equipment involved in the production of each crop, the Yakima Valley farmer who is handicapped in the growing of corn on account of wireworms or alkali will be able to decide more definitely which succulents can be produced most economically on his farm.

Many of the simple rules for the successful feeding of livestock are given in a publication issued by the Bureau of Animal Industry of the United States Department of Agriculture. It is Miscellaneous Circular No. 12, entitled "A Handbook for Better Feeding of Livestock," and the price is 5 cents, which should be sent in cash (not stamps) to the Superintendent of Documents, Government Printing Office, Washington, D. C.

PRINCIPLES GOVERNING CHOICE OF CROPS AND LIVESTOCK

From the information presented on preceding pages, the following principles may be deduced which farmers in the area should bear in mind when selecting and adjusting farm enterprises to meet conditions existing on their farms:

(1) Variations in a farmer's resources influence the selection of enterprises and the returns from farming.
(2) Markets and marketing conditions vary for different farm products.
(3) Farm enterprises vary in their demand upon the resources of the farmer.
(4) Nonmarketable resources must be used when and where they are available.

VARIATIONS IN FARMER'S RESOURCES INFLUENCE THE SELECTION OF ENTERPRISES AND THE RETURNS FROM FARMING

In planning a good farm organization, one of the first things to be considered is a careful analysis of the available farm resources.[8] This is necessary in order to appraise properly the quality and importance of the available resources which contribute to the earnings of the farm business.

If a farm has good uniform soil and markets are available for the crops grown, it may not be desirable or good business in an individual case to keep more livestock than can utilize unsalable or waste products. Where the production of crops for sale is profitable, livestock production is usually not economical unless a considerable part of the production is made from low-grade and waste feeds and labor, which is cheap or would otherwise be more or less wasted.

In selecting and apportioning enterprises on a large farm it is important to estimate carefully the extra costs of labor and materials involved in the production of large acreages of such crops as potatoes and rutabagas, which require considerable expense for extra labor and materials. The probable returns from these extra costs should be calculated in advance to determine if large-scale production will be profitable at the current costs of labor and materials.

On land that is not productive it will be necessary to devote more of the farm to crops which will assist in building up the soil. This will require more livestock to consume the extra quantity of pasture and low-grade feeds resulting from the change in crop organization.

If the water supply on an irrigated farm runs short in the latter part of the season, it will be necessary to grow crops that mature earlier or require more water in the early part of the season.

The fitness of the operator to handle different enterprises successfully is a resource upon which often depends the efficient utilization of all the other resources of the farm. Fitness involves farm training, experience, and personal likes and dislikes. A person will usually attain greater success in an activity with which he is familiar and in sympathy. Such an activity not only gets the benefit of successful experience, but receives more careful thought and attention from the operator. The danger should be recognized, however, of permitting personal likes or dislikes to become too great a factor in the selection and adjustment of farm enterprises. Farming is a business, and each farmer needs to make it his business to determine the combination of enterprises which will prove to be best suited to conditions in the community and on his farm. If a new enterprise seems to possess reasonably permanent advantages in production and marketing, the operator should make up his mind to become an expert in the new enterprise and to like it.

MARKETS AND MARKETING CONDITIONS OFTEN VARY FOR DIFFERENT FARM PRODUCTS

The marketing problem has always been, and probably for many years will continue to be, of even greater importance than production on many irrigation projects in the West. Many farms on these projects are particularly adapted to the production of bulky perishable

[8] The farmer's resources are real estate, irrigation water, machinery, other equipment, work stock, other livestock, the operator's labor and managerial ability, any regular hired labor employed, and such family labor as is available for farm work

products, which results in a tendency for farmers to specialize in these products. The vast surplus production of the area usually must seek distant markets for an outlet. These distant markets for the bulkier products are often prohibitive on account of the high cost of transportation and the low value of the product. Farmers affected by such conditions have two means of overcoming a part of their high freight disadvantage. The first is in the production of more highly concentrated products like livestock and dairy and poultry products or in the production of such crops as beans, clover seed, and small fruits. Where canneries are available several kinds of vegetables may be profitable. The other means is to standardize products and create a demand in distant markets for these products of superior quality.

In planning the farm organization it is essential that the operator study the probable markets for his various products as well as the conditions which affect these markets. This involves a study of possibilities for the efficient marketing of the entire output on individual farms, by direct sales, and by feeding to livestock and a willingness to cooperate with other farmers in the community in an effort to improve the general marketing conditions of the area.

FARM ENTERPRISES VARY IN THEIR DEMAND UPON THE RESOURCES OF THE FARMER

The crops and livestock grown in the Yakima Valley differ considerably in their demands upon the several resources of the farmer. Crops like potatoes and sugar beets need the very best soil and care if good results are to be obtained; other crops like rutabagas, squash, and sweet clover have done remarkably well on land which is too alkaline for other crops.

Pastures and new seeding of alfalfa need frequent applications of water throughout the season. The kind of plant, the stage of plant growth, and the type of soil cause variations in demand upon the farmer's water supply.

Any sudden expansion in the livestock enterprise must take into consideration the probable returns from the outlay of new capital needed in the form of livestock bought, new buildings, fences, etc.

Farm enterprises vary in their demand upon the farmer's labor supply. This often results in competing, complementary, and supplementary relationships which must be understood in order to effect the most profitable farm organization for a given set of conditions.

Enterprises which require attention at the same time are called "competing enterprises." Sugar beets and small grains compete for the farmer's time in the spring, especially if no fall plowing has been provided for. Potatoes, if the planting has been delayed, will compete with alfalfa for labor at the time for cutting the first crop of hay or with sugar beets at the time for thinning. The thing to remember is that certain enterprises are more exacting in their demands as to just exactly the time when certain operations must be made than are others. For instance, sugar beets must be given preference in the early spring, as their success is largely dependent upon early planting. In a similar way, all other farm work becomes secondary to alfalfa when it is time to harvest this crop. Crops also compete for water, and here again certain crops demand preference. Potatoes, one of the most important cash crops on the irri-

gated farms of the valley must have water when the tubers begin to form, even at expense of the other crops. It is therefore necessary to apportion and distribute the resources in advance, in order to avoid, as much as possible, the difficulties encountered from competition between enterprises.

When one farm enterprise contributes toward the success of another, the enterprises are said to have a complementary relationship. Livestock and crops are complementary, because one furnishes food for stock while the other provides fertility for the soil.

Supplementary enterprises are introduced into the farm organization to make the best possible use of resources which would otherwise be idle or wasted. Such resources, whether they be in the form of labor, land, water, or equipment, are worth to the farmer just what he can get out of them. Rutabagas might be used as a supplementary enterprise in midsummer to take the place of some crop which has failed, or they might follow an early-harvested crop, or might be grown to use up surplus labor and equipment which happens to be available at this time. Different classes of livestock are often introduced as supplementary enterprises. Such enterprises sometimes compete for the farmer's time, as, for instance, dairying and crop work during the summer months, but their value to the organization is often of sufficient importance to compensate for such competition as is unavoidable. Adjustments can often be made between the dairy and crop enterprises by arranging to have more of the cows come fresh in the fall.

NONMARKETABLE RESOURCES MUST BE USED WHEN AND WHERE THEY ARE AVAILABLE

On many farms in every community are found nonmarketable resources which are worth to the farmer just what he can get out of them when and where they occur. The importance of these resources is often neglected. The use which the operator makes of them might easily mean the difference between profit and loss on an individual farm.

In such an area as this, where the farm organization consists mostly of crop enterprises, very little productive employment is provided for the operator and his family during a part of the year. Moreover, unmarketable feeds, such as cull potatoes, rutabagas, squash, straw, and beet tops are commonly found on many Yakima County farms. Such livestock as dairy cows, hogs, sheep, poultry, and turkeys are profitable enterprises for using these unmarketable feeds and this unused time. It has often happened in this area that the market price of potatoes, rutabagas, and particularly alfalfa hay, has been so unfavorable that considerable savings would have been possible had more of the crop been marketed through livestock. Even though the farmer often must be satisfied with relatively small returns for the use of these uumarketable resources, his total net income has been increased and his farm business becomes more efficient.

STATEMENT OF PRINCIPLE OF CHOICE

The whole problem of choosing and adjusting enterprises to meet conditions on individual farms might be summarized as follows:

The procedure to follow in choosing and apportioning farm enterprises on a particular farm is to select as the major lines of produc-

tion those enterprises which local conditions and the managerial ability of the operator have proved to be generally most successful and profitable. Around these enterprises fill in such supplementary enterprises as can profitably utilize the remaining portions of the land, labor, water supply, equipment, feeds, and managerial ability, keeping in mind that adjustments are sometimes necessary to maintain or increase the productivity of the land as well as to meet changing conditions of the market.

APPLICATION OF PRINCIPLES DISCUSSED

The following illustrations tell how various farm practices and economic conditions have influenced farm earnings on a few representative farms in the area studied. The more important principles of farm organization, applicable to conditions on each farm, are briefly discussed.

The farms used in the discussion are not necessarily the best or the poorest farms. They are selected primarily for the purpose of illustrating farm-management principles which should be considered by Yakima Valley farmers in planning good farm-organization programs for conditions existing on their farms. Each farm and farmer is discussed separately, showing: (1) A description of the farmer and his resources; (2) results attained from the present organization; (3) principles suggesting good or better earnings on this farm.

It is not probable that all farmers would obtain similar results from the same adjustments in farm enterprises, mostly because of the many variations in farmers' resources as well as in their ability to handle successfully the different combinations of enterprises. Since most farmers, however, are willing to make such adjustments in enterprises as have proved to be satisfactory and to learn to conduct new enterprises profitably, it is reasonable to assume that many Yakima Valley farmers will be assisted in their plans for good farm organization by an analysis of conditions which have influenced farm earnings on other farms in the area operating under similar conditions.

A detailed analysis of the farm business of seven farms operating under widely different sets of conditions is given for the crop year 1922 in Table 26. Incomes from farming during this year were unusually low largely because of the poor prices for potatoes.

TABLE 26.—*An analysis of the business and organization of seven individual farms operating under widely different sets of conditions, Yakima County, 1922*

Item	Unit	Small farm			Medium farm		Large farm	
		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
		Crops	Crops and live-stock	Crops	Crops and live-stock	Live-stock and crops on poor land	Crops	Crops and live-stock
Resources used in farming:								
Land	Acre	20.7	20	40	37	40	80	80
Capital	Dollar	5,911	6,603	11,817	13,579	11,783	18,682	25,811
Land	do	3,900	4,200	9,100	7,500	6,500	13,500	23,000
Dwellings	do	1,000	1,000	1,500	3,000	1,200	1,500	800
Other buildings	do	100	300	400	500	300	1,000	200
Working capital	do	911	1,103	817	2,579	3,783	2,682	1,811

TABLE 26.—*An analysis of the business and organization of seven individual farms operating under widely differerent sets of conditions, Yakima County, 1922*—Con.

Item	Unit	Small farm			Medium farm		Large farm	
		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
		Crops	Crops and live-stock	Crops	Crops and live-stock	Live-stock and crops on poor land	Crops	Crops and live-stock
Labor used per farm:								
Operator	Month	12	12	12	12	8	12	12
Other family	do	1.3				4	3	5
Regular hired	do					3		
Extra hired	do	0.2	0.7	0.8	2.1	0.1	2.7	1.3
Exchange	do	0.3	0.5	1.3	0.8	0.6	0.8	1.3
Utilization of farm area:								
Farmstead, roads, and waste	Acre	1	1.5	0.8	2	3	6.3	6.3
Area in crops	do	19.7	18.5	39.2	35	37	73.7	74.7
Pasture	do		1		2	7.7	1.5	9.0
Family garden and orchard	do	1	1	0.2	1	0.3	0.2	0.7
Alfalfa	do	8.5	7.5	32	11	10	46	36
Potatoes	do	5.7	6.5	7	9		6	13
Wheat	do		2.5		6	2	20	16
Corn for grain	do	1.5			1	2		
Rutabagas	do				3	4		
Miscellaneous	do	3			2	11		
Yields per acre:								
Alfalfa	Ton	6	5	4.5	5	3.5	4.1	3.9
Potatoes	do	10	6.6	10	12		10	5.6
Wheat	Bushel		32		32	55	42	37
Corn for grain	do	75			70	90		
Rutabagas	Ton				16	8		
Crop production (total):								
Alfalfa	do	51	37.5	144	55	35	189	140
Potatoes	do	57	43	70	108		60	73
Wheat	Bushel		80		192	110	840	592
Corn for grain	do	112			70	180		
Rutabagas	Ton				48	32		
Crop production sold:								
Alfalfa	Percent	54		87			77	63
Potatoes	do	20	98	64	51		80	80
Wheat	do		56		100	53	83	90
Corn for grain	do							
Rutabagas	do				83			
Livestock on farms:								
Work animals	Number	2	2	2	4	4	5	4
Other horses or mules	do							
Bull	do					1		
Cows	do	1	5	2	5	6	4	6
Young dairy cattle	do	1		1	5	6		3
Hogs—								
Sows	do		1			7	1	
Boars	do					2		
Other hogs	do	1						
Chickens	do	44	30	12	300	60	36	100
Turkeys	do	3			8			
Livestock production per animal:								
Dairy cows—								
Butter fat	Pound	200	134	105	249	250	140	190
Calves	Number	1	1	0.5	1	0.8	0.8	1
Sows, pigs born	do		11S. 7F.			7S. 2F.	8S. 7F.	
Hens, eggs	do	96	72	72	108	75	60	65
Prices received for products sold:								
Potatoes, per ton	Dollar	10	20	12	16.50		3	8.70
Alfalfa hay—								
Loose	do							
Baled	do	16.50		15			18	19
Wheat, per bushel	do		1		1	2	0.99	0.97
Rutabagas, per ton	do				8			
Cows, each	do							55
Sows, each	do					28		
Other hogs, each	do		5			16		
Turkeys, each	do				6		3	
Financial summary:								
Receipts—								
Alfalfa hay	Dollar	429		1,875			2,628	1,672
Potatoes	do	110	840	540	902		150	487
Wheat	do		45		190	118	693	513
Rutabagas	do				320			
Other crops	do				[1]200			
Total crops	do	539	885	2,415	1,612	118	3,471	2,672

[1] This amount was received entirely from table beets.

TABLE. 26.—*An analysis of the business and organization of seven individual farms operating under widely different sets of conditions, Yakima County, 1922*—Con.

Item	Unit	Small farm			Medium farm		Large farm	
		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
		Crops	Crops and livestock	Crops	Crops and livestock	Livestock and crops on poor land	Crops	Crops and livestock
Financial summary—Continued.								
Receipts—Continued.								
Sows	Dollar					57		
Other hogs	do		40			1,397		
Cows	do				65			55
Other cattle	do	13	45	30	40	15	34	24
Chickens	do		50		50		30	45
Turkeys	do				300			
Butterfat or milk	do		175		480	710	75	422
Eggs	do	25			300	80		180
Other livestock cash receipts	do					54	168	
Total livestock cash receipts	do	38	310	30	1,235	2,313	307	726
Other farm cash receipts	do	8	113	420		620		
Total cash receipts	do	585	1,308	2,865	2,847	3,051	3,778	3,398
Increase in inventory, livestock, feed, supplies, machinery, and building	do	170	95	7	254	320		235
						62		
Total farm receipts	do	755	1,403	2,872	3,101	3,433	3,778	3,633
Expenses—								
Year and month hands	do					105		
Day hands—								
Alfalfa	do	14		54		10	135	66
Potatoes	do	8	54	10	98		70	130
Other	do				91		12	
Contract labor	do		80	63	130		55	81
Board of hired labor	do	3	5	18		61	58	10
Machine work hired—								
Threshing	do		7		17	20	91	59
Baling	do	65		312			415	244
Other	do				15	5		
Repairs—								
Machinery	do	15	10	25	30	25	100	25
Buildings, fences, drains	do	35	15	20	34	23	10	24
Livestock bought	do	38		2		275	118	
Feed bought—								
Dairy	do					63		15
Hogs	do					283		
Other	do	50	30	5			85	
Seed bought—								
Potatoes	do		135	78	200		190	202
Other	do	11	9		39	34	57	70
Charge for farm use of auto	do		102	137	165	102	172	241
Taxes—								
Real estate and personal	do	109	150	305	346	301	588	525
Water maintenance	do	26	20	100	37	40	96	80
Other cash expenses	do	33	14	143	253	60	211	179
Total cash expenses	do	407	631	1,272	1,455	1,407	2,463	1,942
Value of unpaid family labor	do	89				100	75	115
Decrease in inventory—								
Decrease in livestock	do			159			155	
Decrease in feed, supplies, machinery, and buildings	do	92	10 85	113	332	110	258	123
Total farm expenses	do	588	726	1,544	1,787	1,617	2,951	2,180
Cash receipts less cash expenses	Dollar	178	677	1,593	1,392	1,644	1,315	1,456
Farm receipts less farm expenses	do	167	677	1,328	1,314	1,816	827	1,453
Value of operator's labor	do	40	500	600	800	600	800	750
Per cent return on farm capital	Per cent	0 3.9	2.7	6.2	3.8	10.2	0.1	2.7
Value of family living from farm	Dollars	387	442	418	726	442	494	312
Members in family on farm	Number	3	4	4	5	5	9	5
Members in family on farm under 16 years	do		2	2	2	3	6	3

FARM NO. 1, A 20-ACRE CROP FARM

Description of the farmer and his resources.—This farm is representative of many of the smaller farms in the area, on which alfalfa and potatoes are the principal crops grown and little livestock is kept. Uniform, good crop yields and good markets, on the average, have contributed to the unimportance of livestock on this farm. In 1922, 8.5 acres was devoted to alfalfa, 5.7 acres to potatoes, 3 acres to new seeding of alfalfa, and 1.5 acres to corn for grain. (See Table 26.) The farm is well equipped with the necessary machinery to conduct a crop system of farming. Buildings for livestock, however, are not sufficient to care for a further expansion in the livestock enterprise. One-half month of outside labor was used in the farm business in 1922, nine days of which was paid back in exchange labor by the operator. The operator is 55 years old and has a mortgage on his real estate amounting to 48 per cent of the estimated real-estate value.

Results from present organization.—The income was very low on this farm in 1922. Cash receipts amounted to $585, of which hay contributed 73 per cent and potatoes 19 per cent. After deducting cash expenses, only $178 was left from the farm receipts with which to pay debts and living expenses of the family. In addition to receipts the family had the use of farm-furnished products estimated to be worth $387.

PRINCIPLES APPLICABLE TO THIS FARM

Good crop yields of high quality are essential to economical production, especially on such farms as this, where practically no livestock is kept to utilize cheap and low-grade crop products which can not be sold to advantage. This farmer had a particularly bad year for potatoes. Not only were prices the lowest in many years, but the operator had an unusually large percentage of cull and low-grade potatoes. Only 20 per cent of the potato production was sold. A small part was utilized by the livestock on the place, and the remainder went to waste.

A large part of the poor results from the potato crop on this farm was due to planting poor, locally grown seed. The experience of the best potato growers in the area shows the need of planting only the best seed potatoes, which usually must be obtained from other regions. Since it is always easier to sell high-grade products, it is especially important that quality of production be kept in mind to insure the best possible demand for farm products at the highest market value.

Probable prices for crop products need to be carefully considered in planning good farm organization for this farm. Like many other hay and potato growers in the valley, this farmer based his acreage largely upon relative profits for the previous year. The poor results from the potato enterprise in 1922, caused by poor quality and low prices, led this farmer to plant only enough potatoes for his own use in 1923. Good alfalfa-hay prices in 1922 encouraged an expansion in the alfalfa acreage the following year. In 1923 prices were good for potatoes and poor for alfalfa hay, the same as for the crop year 1921. It seems therefore that the average income on this farm could be considerably improved by maintaining a more uniform acreage of alfalfa and potatoes each year.

A more economical utilization of idle and waste resources applies to conditions existing on this and many other farms in the area. The keeping of about six cows and two sows seems to be justified on this farm to utilize the low-grade and unmarketable feeds and pastures that occur in the production of alfalfa, potatoes, and other cash crops and to provide a profitable utilization for a large part of the idle labor which occurs during the winter months and between the second and third hay cuttings.

Small units are seldom economical unless they are supported by resources which would otherwise be more or less wasted. When the major enterprises are small units, as compared with major enterprises conducted by other farm families in the area, the operating cost for these enterprises and for the farm business as a whole is considerably increased. Small units make less efficient use of labor and equipment. The major enterprises should be large enough to provide profitable employment for the operator and his family for the greater part of the year. This is not possible with only 8 acres of alfalfa and 5 acres of potatoes and no supplementary enterprises. This farmer should try to rent additional land, 20 or 30 acres, or farm more intensively the land which he has. If it is not practicable to rent the additional land, about the only opportunity this farmer has to increase his farm earnings, by adjustments in enterprises, is by the addition of more cows, hogs, and poultry and such crop enterprises as will increase the net earnings per acre of land. Tomatoes, rutabagas, and other vegetables usually find available markets in the near-by canneries or cities and are often economical to grow, especially if the soil is adaptable and the operator is fitted to conduct such enterprises successfully and utilize labor that would otherwise be more or less idle or wasted.

FARM NO. 4, A 37-ACRE CROP AND LIVESTOCK FARM

Description of the farmer and his resources.—This is a medium-sized farm, with good soil, on which crops and livestock have been combined successfully. Of the 35 acres in crop in 1922, 11 acres were devoted to alfalfa, 9 acres to potatoes, 6 acres to wheat, 3 acres to rutabagas, 1 acre to corn, and 5 acres to other crops, pasture, and garden. The productive livestock amounted to 5 grade Holstein cows, 5 heifers, 300 chickens, and 8 turkeys. The operator is 47 years old and has a wife and three children. The farm, purchased in 1918, carries a mortgage amounting to 45 per cent of its real-estate value. There is sufficient equipment on the place to conduct successfully the various crop and livestock enterprises.

Results from the present organization.—Crops contributed 57 per cent of the total cash receipts in 1922 and livestock 43 per cent. All of the hay raised was kept for feed. One-half of the potatoes, all of the wheat, and 83 per cent of the rutabagas were sold. Taxes, hired labor, and seed were the highest items of cash expense, amounting to 65 per cent of the total. The cash income, or the difference between cash receipts and expenses, amounted to $1,392. A more detailed analysis of the farm business of this farm, for 1922, is given in Table 26.

PRINCIPLES APPLICABLE TO THIS FARM

Combining livestock with crops is likely to improve incomes from farming on most farms in this area. The operator of this 37-acre

farm, with less family labor available for farm work than most operators of medium-sized farms, managed to handle livestock enterprises with profit along with his crop work. If the operator followed the practice of a few crop farmers in the area and kept only one cow for family use and enough chickens to furnish eggs for the family, his net receipts would have been about $750 less than they were, as shown by the following comparison:

Present organization (see Farm No. 4, Table 25):		
Cash crop receipts	$1, 612	
Cash livestock receipts	1, 235	
Total		$2, 847
Extra cost of keeping additional livestock:		
170 bushels corn at 50 cents	$85	
100 bushels wheat at $1	100	
Miscellaneous	32	
Total		217
Cash returns from organization		2, 630
Same farm without additional livestock:		
Cash crop receipts (same as above)	$1, 612	
16 tons hay at $15	240	
Total		1, 852
Cost of baling 16 tons of alfalfa hay		40
Cash returns from organization		1, 812
Difference in cash returns between the two organizations		818

In these calculations only the extra costs and receipts, due to keeping the additional livestock, are considered. It is assumed that each of the four cows used 4 tons of hay which could be sold at $15 per ton, the average price for the year; that $3 per cow will cover breeding fees, veterinary, etc.; and that $20 will cover grit, charcoal, spray material, etc., for the chickens and turkeys. All of the corn and wheat held over from the previous year was fed to the poultry. No feed was purchased during the year.

By keeping the additional livestock this operator was able to increase his farm earnings approximately $800. It also helped him to obtain his extra high crop yields and to provide productive employment for a large part of the farm labor which would otherwise have been idle. Perhaps the most important advantage of the livestock enterprises as a side line was in stabilizing farm earnings, which in recent years have been uncertain on account of sharp fluctuations in alfalfa and potato prices. Many strictly hay and potato farmers in the area, such as the operator of Farm No. 3, Table 25, can insure better long-time average incomes by keeping at least enough livestock to use a large part of the surplus and unmarketable crop products and the idle or unproductive family labor available for farm work.

Planning the farm work and the utilization of resources in advance enabled farm No. 4 operator to obtain more efficient results from the utilization of his labor and other resources. To provide winter pasture for his cows, this farmer seeded the potato ground to rye as soon as the potatoes were harvested. This furnished good cow pasture from about November 1 to March 15 on the land which was to be

used for crops the following spring or until June 15 on rutabaga land. The work on the 3 acres of rutabagas came at a time when the attention demanded by the other enterprises was not so compelling. All of the unmarketable rutabagas and a small portion of cull potatoes were utilized by the livestock enterprises.

The surplus skim milk was utilized by chickens and turkeys; no hogs were kept during this year. During the previous year fifteen 300-pound hogs were marketed at 7 cents a pound. Even though it might have been more profitable to feed the skim milk, corn, and wheat to poultry instead of to hogs, it seems that the operator was hardly justified in not keeping a hog or to utilize wastes from the table and some of the cull potatoes and to provide meat for the family.

Occasionally there is an opportunity to increase farm earnings by producing special products. When local markets and climatic and soil conditions justify the production of special crops or livestock products, a few farmers will often find it profitable to assist in supplying the demand for these products. This farmer furnishes a good illustration. In 1922 he grew 2 acres of table beets that yielded 10 tons of marketable beets. These were sold to a cash buyer for $20 per ton. During the previous year this farmer planted 3 acres of squash, mainly for hog and cattle feed. From the 30 tons of squash produced the operator obtained 200 pounds of seed, which was sold at 60 cents a pound. Another illustration is furnished by the operator of Farm No. 5, who was able to increase the income from his Jersey cows by obtaining a special market and prices for high-grade milk, while most of the other farmers were required to sell butterfat.

FARM NO. 5, A 40-ACRE LIVESTOCK AND CROP FARM ON POOR LAND

Description of the farmer and his resources.—This farm is selected to illustrate how a farmer with considerable poor land was able to select and manage enterprises in such a way as to increase the productivity of his soil and at the same time maintain good farm earnings. About 15 acres of the land is subirrigated. The alkali is forced to the surface and crop production is made unprofitable. Livestock has been made a major enterprise on this farm in order to improve the productivity of the soil and increase the farm earnings. In 1922, 10 acres were devoted to alfalfa, 4 to rutabagas, 2 to corn, 2 to wheat, and 8 to pasture. The productive livestock at the beginning of the year amounted to 6 purebred Jersey cows, 1 purebred bull, 6 young dairy cattle, 7 purebred sows, 2 boars, and 60 chickens. Two boys, 12 and 13 years old, and occasionally the wife, help with the chores. The operator, who is about 45 years old, earned $620 in 1920 working off the farm in the locality. A man was hired to do the spring work from March 1 to June, while the operator worked out. The real estate carries no mortgage.

Results from the present organization.—Livestock and livestock products contributed a little over three-fourths of the total cash receipts on this farm in 1922, and outside earnings contributed about 20 per cent. A very large part of the high livestock earnings was due to exceptionally good livestock prices and production.

Taxes, feed, and livestock purchases, and hired labor make up the principal items of expense. All but $346 worth of the feed used by the livestock for the crop year 1922 was raised on the farm.

PRINCIPLES APPLICABLE TO THIS FARM

Quality and quantity of livestock and livestock production was this farmer's principal means of overcoming many of the crop disadvantages due to poor soil. By aiming at quality in both livestock and crop production the operator was able to dispose of the pigs from his seven sows at high prices as breeders, the milk from his Jersey cows at special prices while other farmers sold butterfat, and the wheat for seed at twice the value of market grain. Along with quality this farmer provided for a large volume of production, which is necessary to obtain satisfactory earnings from major enterprises.

Adjusting crop enterprises to the various soil conditions was well carried out on this farm. This farmer understood the productive capacity of the soil in all parts of his farm and the crops best adapted to the different conditions. Two acres of alkali land which had been used only for permanent pasture was seeded to sweet clover. This not only provided for an abundance of excellent pasture, but the sweet clover roots helped to open and drain the soil and make it possible to grow other crops. It is the intention of this farmer eventually to reclaim all of his alkali land with sweet clover and livestock. Rutabagas do comparatively well on alkali land, and 4 acres of the poorer crop land was devoted to this crop.

Comfortable quarters for livestock are an aid to economical production. Although expensive buildings are neither necessary nor economical in profitable livestock production, this farmer would be justified in providing more comfortable quarters for his cows and hogs. Comfortable and attractive quarters are especially important to a farmer with valuable purebred stock. Good housing contributes to the health and contentment of the animals and enables them to attain the high records of performance upon which depende so much of the value and earnings of purebred stock. Attractivs quarters help to advertise the superior quality of high-grade livestock. The fact that the operator has no mortgage against his real estate makes it appear especially safe and desirable to invest in these permanent improvements at this time.

FARM NO. 7, AN 80-ACRE CROP AND LIVESTOCK FARM

Description of the farmer and his resources.—Lower crop yields are making it necessary for the operator of this large-sized farm to turn his attention to methods which will increase the fertility of his land and at the same time provide the best possible income for the family. The land is spotted, some 9 or 10 acres being rather unproductive because of continuous cropping and the original poor quality of the soil. Thirty-six acres, or 48 per cent of the cropped land, was used for alfalfa hay; 16 acres were planted to wheat and 13 acres to potatoes in 1922. At the begininng of the year the farmer had 6 cows, 3 heifers, and 100 hens. The operator owns 40 acres and share-rents 40 acres. The operator's real estate is mortgaged for 43 per cent of the estimated present value of the land and buildings. Two sons, 10 and 12 years old, and a daughter, 15, are beginning to add considerably to the available farm-labor supply. Buildings are not sufficient to house the dairy and poultry enterprises comfortably.

Results from the present organization.—The livestock enterprises, even though small, helped to offset the losses caused by poor potato

yields and prices. The alfalfa yield on this farm was below the average for the area, but the operator obtained a very good price for his alfalfa hay, which resulted in a comparatively high value per acre. Alfalfa hay alone contributed 49 per cent of the total cash receipts and livestock 21 per cent. The results from the present organization were considerably reduced on account of the large acreage and low yield and price of potatoes, the high cost of seed potatoes, and extra labor in harvesting.

PRINCIPLES APPLICABLE TO THIS FARM

Good foundation stock is important in building profitable livestock enterprises. This farmer had 3 cows and 3 heifers on March 1, 1921, and by raising practically all of the heifer calves, the herd was increased to 8 cows and 1 heifer by March 1, 1923. The operator's aim is to keep 12 cows. Since so much of the success of the dairy enterprise depends upon high milk production, only the calves from the very best cows should be used in building up the herd. With an average butterfat production of a little less than 200 pounds per cow on this farm, the operator could wisely consider the importance of going outside of his own herd for young stock with which to build up his dairy. It is poor economy to raise calves from animals which do not have high butterfat records. The difference between the price of calves from good and poor stock is often small, but the difference in the value of these calves as cows is always of great importance to the success of a dairyman.

Egg production was also low on this farm. The extra money paid out for eggs or day-old chicks from high-record hens is one of the best investments for all farmers who keep poultry, particulary those who must depend upon poultry for a large part of their earnings. Better quarters for poultry on this farm would increase the average egg production.

Before going into an enterprise extensively, it is important to consider the extra costs of labor and materials involved, and also the probable yields and prices for the products produced. The operator of this farm needs to study more carefully the possibilities for the economical production and marketing of the more important crop enterprises. Potato yields on this farm in 1921 and 1922 were about 4 tons less than the average for the farms studied in the area. In spite of this fact, 25 acres were planted to potatoes in 1921 and 13 acres the following year. Low yields, low potato prices, and high material and labor costs all contributed to make potato production decidedly unprofitable on this farm during both years. Extra material and labor costs amounted to about three-fourths of the potato receipts in 1921 and more than the receipts in 1922.

With a little study and assistance in production and marketing problems, for conditions on this farm, the operator would be able to predict rather closely the probable results from different combinations of crop enterprises. This is made possible by carefully considering in advance the productivity of the soil to be used for each crop, the soil requirements of various crops, the seasonal and total labor requirements for each crop, the quantity and quality of the available labor supply, the cost of extra labor and materials needed, and the probable price of the product when it is to be sold. All of these factors except the last one can be rather closely determined in

advance for most crops. Much of the guess over probable prices will be removed by a study of price trends and outlook reports for each crop. This farmer and others in the Yakima Valley will be assisted in planning their farm organization by a careful study of the factors of production, as outlined in this bulletin.

Had the operator of this farm carefully considered in advance the possibility for economical potato production and efficient marketing, his results from farming in 1921 and 1922 would probably have been very different. By applying 1922 local prices to the material and labor requirements for potatoes, he would have discovered that the total extra material and labor costs for producing and marketing potatoes would amount to $7.05 per ton for the standard conditions and $8.56 per ton for conditions on his farm as illustrated in Table 27. This production handicap of $1.51 per ton for extra labor and materials alone would immediately suggest the need of closely analyzing the probable returns from potatoes and crops which could be substituted for a part of the potato acreage. It has been assumed, in making this calculation, that the operator and his family did all the work on potatoes except picking, hauling to cellar, sorting in cellar, and hauling to market.

TABLE 27.—*Potatoes: Cost of extra labor and material needed for production under standard conditions and under conditions existing on Farm No. 7, Yakima County, 1922*

Item	Unit	Extra labor and material costs for potatoes	
		Under standard conditions	Under conditions on Farm No. 7
Total potato yield per acre	Ton	9	5.6
Culls	Per cent	10	10
Marketable yield per acre	Ton	8.1	5
Extra material costs per acre:			
Seeds, 900 lbs. at $0.02	Dollar	18.00	18.00
Sacks, 175 for 9-ton yield at $0.08	do	14.00	8.90
Twine, 1.4 lbs. for 9-ton yield, at $1	do	1.40	0.90
Total	do	33.40	27.80
Extra labor costs per acre:			
Picking, 26 hours for 9 tons, at $0.30	do	7.80	5.04
Haul to cellar, 3 hrs. 9 tons, at $0.30	do	0.90	0.60
Sort in cellar, at $1 per ton	do	9.00	5.60
Haul to market, at $0.75 per ton	do	6.00	3.75
Total	do	23.70	14.99
Total extra material and labor costs per acre	do	57.10	42.79
Total extra material and labor costs per ton	do	7.05	8.56
Other costs, per acre:			
Interest on land, $250 at 6 per cent	do	15.00	15.00
Taxes, real estate	do	7.00	7.00
Taxes, water	do	1.00	1.00
Family labor, 49 hours, at $0.30 [1]	do	14.70	14.70
Horse labor, 68 hours, at $0.15 [1]	do	10.12	10.12
Depreciation and interest on machinery [2]	do	3.00	3.00
Total other costs, per acre	do	50.82	50.82
Total other costs, per ton	do	6.28	10.16
Total extra material and labor costs per ton	do	7.05	8.56
Total other material and labor costs per ton	do	6.28	10.16
Total, or price per ton needed to pay for above costs at the different yields	do	13.33	18.72

[1] Man and horse labor; total for operations (except hauling to cellar) as given in Figure 12.

[2] The cost of machinery was not determined in this study. The machinery cost used in this illustration was obtained by charging 10 per cent for depreciation and 8 per cent for interest on the average value of machinery for the group of medium-size farms in 1922, Table 9, and dividing the total by the average number of crop acres in the farm.

Carrying the costs a step further to include charges for the use of land, family labor, and depreciation and interest on machinery, it is found that in order to pay for all of these costs, including extra labor and materials, it will be necessary to receive a price of $13.33 per ton for potatoes grown under standard conditions and $18.72 per ton for potatoes grown under conditions on Farm No. 7. In a similar way it is possible to compare with the standard the production advantages for other crops grown on an individual farm.

The soil, labor, and marketing conditions on this farm, together with the operator's interest in livestock production, suggest the following distribution of the 74 acres of land available for crops and pasture:

	Acres
Alfalfa	40
Wheat	11
Potatoes	7
Corn	3
Rutabagas	4
Sweet-clover pasture	4
Permanent pasture	5
Total	74

Under this distribution of crop area, one-fourth of the land in alfalfa would be turned under each year. This would be put into potatoes and corn. If the land is uniform and productive and the outlook for potatoes seems good, the entire 10 acres could be planted to potatoes and rutabagas could be left out of the organization for this year. Land which has been in potatoes one year could be distributed to corn, rutabagas, squash, or sweet clover pasture. The particular crops to grow, and the acreage of each, would depend upon the soil, market outlook, needs of livestock, the available labor supply, and extra cost involved. Four of the 9 acres of poor land now used for pasture would be seeded to sweet clover and 5 acres left for permanent pasture. As the poorer land is reclaimed by manure and sweet clover, less pasture area will be needed. From 10 to 15 acres would be seeded to wheat and alfalfa each year.

The aim of this farmer should be to increase the fertility of his soil and at the same time obtain the highest possible average income. Alfalfa, sweet clover, and livestock provide the best opportunity for increasing the soil fertility. A more careful selection of the potato land and a reduction in acreage should considerably increase the yield. Good yields of rutabagas and a fair price would make rutabagas a desirable cash crop.

No one crop or livestock organization can be devised that will best suit the production and marketing conditions on all farms in an area. Each operator must choose his own combinations of enterprises in the light of his own farm experience and existing conditions on his farm. Slight shifts in the organization may be necessary or desirable each year, because of changes in marketing conditions and in the availability of farm resources necessary to the economical production of crop and livestock enterprises.

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